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VETERINARY MEDICINE

JANUARY CONTENTS 1947

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No. 1

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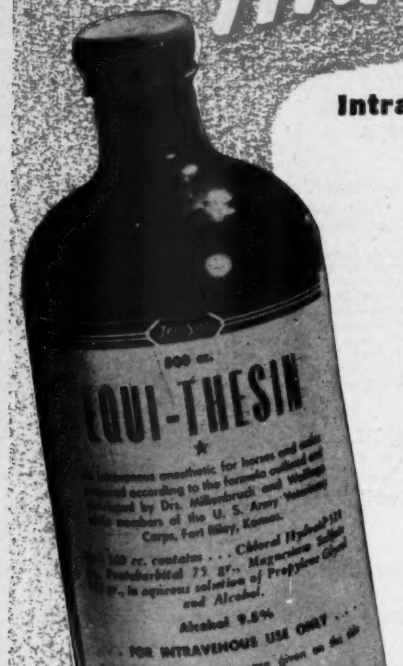

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It is stated in *Hygeia* that out of 550,000 births there is one set of quadruplets, out of 57,000,000 births there is one set of quintuplets.

Rous of the Rockefeller Institute has demonstrated that skin grafts unite on the beds quicker if "activated" by irritants before they are transferred.

Hookworm infected soil may be sterilized by the use of strong salt-brine made by stirring 1.5 lb of salt into a gallon of boiling water and sprinkling over the soil surface to saturate the earth to a depth of one-half to 1½ inches. —*Vet. Rec.*

It requires 10 thousand pounds of pancreas to produce one pound of powdered insulin. The processing of the glands, checking and testing the product requires nine months. The lives of 600,000 persons in the U. S. depend upon a regular supply of insulin.

Kolb and Gray, two Navy medical officers, report serious nerve injuries in seven patients due to penicillin injections into muscles. Both paralysis and loss of sensation occurred from 10 to 21 days following the injections. Five of the seven patients recovered within four months.

Penicillin lozenges have proved exceedingly effective against oral infection according to reports from the college of Dentistry, University of California. The lozenge of penicillin is placed between the gum and the cheek. Since it dissolves slowly it keeps a high concentration of penicillin in contact with the affected area.

A normal red blood cell lives 120 days.

The man who is well is likely to do himself harm [in eating] only if he distrusts his inclinations in the selection of food, and if he tries to be cleverer than nature by the choice of a particularly unusual diet.—*Pütter.*

Distemper in mink was first reported in this country by Dr. Richard N. Shaw, in 1932.[1] He reported an outbreak of the disease among 1129 mink on a ranch at Garland, Maine. Necropsy and laboratory studies were reported.

Smallpox reached its lowest ebb in the United States in 1945, according to statisticians of the Metropolitan Life Insurance Company. Last year only 346 cases were reported in the entire country, and thirteen states and the District of Columbia were completely free of the disease. The smallpox-free states last year were all located on the Atlantic seaboard. Top honors went to Rhode Island, which has not had a case since 1928.—*Hygeia.*

Nitrogen mustard a "war gas" developed, but not used, during the late war is particularly destructive to neoplastic tissue; in this respect resembling X-rays. By injection of carefully regulated doses beneficial results have been obtained in a few cases of Hodgkin's disease and other widely disseminated neoplasms. Only in exceptional cases does nitrogen mustard therapy possess any advantages over X-ray treatment.

[1] Shaw, Richard N. Distemper in Minks. *Vet. Med.* 27:12, pp. 511-515, 1932.

American Veterinarians Wanted in Greece

The Greek government contemplates the establishment of a veterinary college as a part of the University of Athens or the University of Salonica. To assist in organizing this school, it is anxious to obtain the services of five or more experienced, American veterinarians for a period of two years or longer. Subjects for which teachers are sought are: anatomy embryology, histology, physiology, pathology, surgery, clinic, therapeutics and food hygiene and inspection.

Retired professors or associate professors who are willing to undertake this work for a period of at least two years are urged to communicate with Dr. B. Hadziolas, Greek Embassy, Washington, D. C., with whom all financial arrangements will be made.

Conflicting Dates of Veterinary Meetings

For a good many years there have been more or less desultory suggestions of agreements among veterinary associations to stagger their meeting dates to avoid having meetings in adjoining states on the same days. Little has been accomplished other than occasional such agreements.

At a meeting of the National Veterinary Exhibitors' Association in Boston, during the annual meeting of the A.V.M.A. a committee was appointed to serve as a clearing house for information concerning the annual meeting of state veterinary associations and veterinary conferences and short courses. When sufficient information has been compiled it will be printed and supplied to all association secretaries and others desiring it.

To facilitate collection of this information officials of all regional state and district veterinary associations are asked to supply the chairman of the committee, C. Guy Stephenson, Goshen Laboratories, Goshen, N. Y., with the following data concerning their respective associations.

1. Traditional meeting dates.
2. Usual place (city) of meeting.
3. Average attendance at meetings.
4. How is the meeting date fixed (constitution, bylaws, vote of association, selected by officials etc.).
5. Any understandings with other associations to avoid conflicting meeting dates.
6. Would there likely be a willingness to shift meeting dates (1) within the same week, (2) to the preceding or following week (3) to a different month, provided it would facilitate getting good guest speakers and better commercial exhibits and also permit members to attend meetings in nearby states?

It is realized that associations wish to hold meetings on dates most convenient for their members, but it is believed no difficulty will be experienced in arranging non-conflicting dates for meetings except during the month of January. It is thought if associations will consent to shift their meetings to dates only a few days earlier or later that eight non-conflicting meetings can be scheduled for that month. By dividing the country into grand divisions of six to a dozen or more states conflicting dates within divisions can be avoided.

Secretaries and other association officials are urged to send the information listed above to Mr. Stephenson as soon as possible that a coördinated plan may be prepared in advance of the January 1947 meetings for submission to the associations for consideration at their meetings during that month.

Poultry Meat Inspection

In the past ten years the amount of poultry meat inspected by the USDA Poultry Inspection Service has increased 800%. In 1936, 12 inspectors inspected 26 million pounds of dressed poultry. In the past year 153 inspectors inspected 206 million pounds at about 150 poultry processing plants. The inspection is not mandatory for processing plants.

Use for Surplus Veterinary Books

As many of our readers know, the University of the Philippines was used by the Japs as a military post during the occupation of Manila and was burned just before the liberation. The two principal buildings of the Veterinary College with all records of the school was completely destroyed as was the Scientific Library and the library of the veterinary school.

One of the greatest handicaps encountered on the resumption of teaching in the veterinary school was lack of textbooks and reference works. It is thought veterinarians in the United States may wish to aid the College of Veterinary Science in this matter. Any veterinary works for which the owner's have no further need will be welcomed by the Scientific Library. Donations need not be of the latest editions, but, naturally, the later the editions the more useful the works. The books should be sent to:

The Philippine Embassy,
1617 Massachusetts Ave., Washington 6, D. C.

They should bear the inscription:

For Scientific Library, Bureau of Science, Manila, Philippines.

Postage is three cents per pound plus 3%.

Two cases of severe pulmonary tuberculosis in persons due to avian tubercle bacilli were reported in the *Lancet* (London) 250, p. 89.

It is reported that chlorodiazine and bromodiazine are 10 times as effective in the control of coccidiosis in poultry as is sulfaguanidine.

The Indiana Poultry Flock Record Summary for 1945 indicates that the all-pullet flocks are more profitable than the mixed flocks. In all-pullet flocks the income ranged from $2.40 to $2.65 per bird as compared with $1.86 to $1.95 for the hens and pullets flocks.

A case of White Plymouth Rock hatching eggs were chilled so severely that 14 eggs in various parts of the case were frozen so solidly that the shells were cracked, yet 48% of 344 eggs from this case hatched healthy chicks when incubated. This experience supports recent research indicating that chilling of hatchings eggs may not be as harmful to them as has been supposed.

Value of Older Hens Increased

Manganese raised egg production 39% in old layers in trials at the Texas Agricultural Experiment Station reported by J. R. Couch,

L. E. James, and R. M. Sherwood (Feedstuffs, Vol. 18, No. 31). They used one-fourth of a pound of manganese sulfate in every ton of laying mash.

In addition to this increase in egg production, these hens in their second year of production produced 8% more fertile eggs, hatchability was increased by 22%, and there were 15% fewer chicks dead in the shell at the end of incubation. Less vitamin D was required, and egg shell quality was improved. There was less benefit from feeding manganese to pullets in their first year of production.

These results are of particular interest because of the practice of using older hens for the production of hatching eggs.—*Everybody's Poultry Magazine.*

Hawkins and Rausch at the Michigan experiment station found sodium sulfamerazine administered in the drinking water superior to the relatively insoluble sulfamethazine both as a preventive and treatment for coccidiosis in chicks.

The Maine Agricultural Experiment Station, following a two-year feeding test, conclude that second crop ladino clover silage fed at the rate of 4 pounds per 100 hens daily is a satisfactory substitute for alfalfa meal in the ration.

Morehouse and Mayfield report *(J. Parasit.,* 32:1) good results from the use of two aryl arsonic acids (4-hydroxy phenylarsonic acid and 3-nitro 4-hydroxy phenylarsonic acid) as a preventive of coccidiosis in chicks. These arsenical preparations were ineffective as treatments for coccidiosis.

In an experiment conducted by the University of Wisconsin it was found that when sulfa drugs were fed poultry it required three times the amount of folic acid to prevent folic acid deficiency which is closely related to perosis in chicks. This suggests the thought that during treatment with sulfonamides, a folic acid deficiency may become evident. A new synthetic* folic acid was used and it was found to be fully satisfactory in preventing poor growth, poor feathering condition and anemia.

Thirty years ago the average hen produced 80 eggs; 20 years ago she produced 100 eggs; now the average production exceeds 150 eggs per year. Unimproved hens begin laying at one year of age and produce about 30 eggs per year. Some hens have commenced laying at 5½ months of age and produced 360 eggs in a year.

By-Products from Poultry Waste

If 75 million of the 100 million broilers that are raised annually on the Del-Mar-Va Peninsula were evicerated at the dressing plants there would be in waste products more than eight million pounds of blood, twice as much of feathers and five times as much offal. The total would be over 3,400 tons each year.

Since the feathers and offal constitute more than 25% of the live weight of a 3-pound broiler, M. A. Jull, University of Maryland, believes that much of such waste should be utilized in the manufacture of by-products—gelatin, oil for soap, meat scrap for poultry from the offal and mattresses, plastics, adhesives and textiles from the feathers.

Altitude Tolerances of Animals

(Authenticated News)

DOG BEING LOADED ABOARD PLANE IN LOS ANGELES

The altitude to which a dog, cat, canary, fish, or baby chicks can be flown without suffering ill effects—vital in the new post-war age of air travel and air freight—can at last be answered with certainty. Confronted with hundreds of queries from pet owners, poultrymen, florists and other commercial shippers, investigators set out months ago to find out what effects altitude has upon animals and plants. In general, it was found that animals can tolerate higher altitudes than man, and that babies of every species have greater "altitude tolerance" than older forms of life. Human beings, shell fish, and certain flowers have the least resistance to altitude. A normal person "feels" altitude somewhere between 12,000 and 15,000 feet, yet is capable of continuous existence at the 17,000 to 18,000-foot level, the research report reveals. Dogs in good health suffer no ill effects up to 25,000 feet. Since commercial airliners rarely fly over 17,000 feet high, there is a safe margin even for sub-normal animals. Normal cats can easily stand 24,000 feet, but surgically decerebrate cats should not be flown above 20,000. Rabbits display no lethal effects of altitude until they are taken above 27,000 feet. Of interest to poultrymen and bird lovers is the fact that birds in general are extremely resistant to altitude. Wild geese have been observed flying as high as 29,000 feet, and crows, storks, cranes, and finches frequently fly at 20,000-foot altitudes. Hatching eggs in laboratory experiments have withstood altitudes of 80,000 feet, but chickens of any age have a tolerance of around 17,000 feet, although no permanent harm will probably result if they are flown as high as 20,000 feet. This is a bit too high for live crabs and lobsters, however. If properly packaged in wet burlap, they may be flown 17,000 feet, but no higher. Live fish in water may be carried as high as 20,000 feet if the fish population per gallon is reduced to one-half the number suitable at sea level. Experiments on cut flowers and fruits indicate that, with careful packaging, they may be flown as high as 25,000 feet

Sensational Discoveries in Horse Pathology

Six baffling puzzles in equine pathology have been resolved in recent years: (1) Brucella in fistula of the withers and poll evil, (2) the virus cause of old "blind staggers," (3) the local metabolic debacle accountable for azoturia, (4) the nutritional nature of periodic ophthalmia, (5) virus abortion and (6) the relationship of histamine to founder and the possibility that it bears a relationship to periodic ophthalmia. When clinical veterinary medicine was predominantly equine, these discoveries would have been hailed for celebration.

Stock 1029 Effective Against Ear Ticks

The ear tick, *Otobius* (ornithodorus) *mégnini* is a common parasite of livestock in the Southwestern States and sometimes attacks man. The immature tick lives in the ears. Research workers in the U.S.D.A. tested various chemical compounds and mixtures over a long period as treatments for this tick infestation. What they term "stock 1029" proved the most effective of the parasiticides tested.

Stock 1029 is a mixture of pyridine in an adhesive containing 45% of rosin, 40% of Hercolyn (hydrogenated methyl abietate), and 15% dibutyl phthalate. The adhesive (called adhesive A58) is prepared by slowly heating the rosin, Hercolyn, and dibutyl phthalate, being careful to keep the mass well stirred until the rosin is liquefied. The mixture should not be overheated. As soon as the rosin is thoroughly liquefied, the heat should be removed and the mixture allowed to cool. When the adhesive is almost cool, 10% of pyridine (practical grade) should be added and the mixture stirred until uniformly mixed. Stirring should be done out of doors or in a well-ventilated room. Pyridine is inflammable and should be kept away from open flame.

Method of Applying Stock 1029

Stock 1029 should be applied to the ears of livestock by means of a 1-inch paint brush. A brushful of the mixture should be inserted well down into the outer ear and rubbed about enough to insure a complete coverage of the deep convolutions and the inner surface of the outer ear. Animals may be treated in an open chute, but it is more convenient to use a stanchion or dehorning chute where the animal's head can be held more or less rigid. One gallon of stock 1029 will treat approximately 125 head of cattle.

Handling Dislocations

I want to emphasize the matter of judgment in the handling of dislocations. We who have to do with athletic injuries often find that we have to follow the first aid of an enthusiastic athlete who takes a dislocation and tries to reduce it by main strength and awkwardness. That does more harm than good. Many persons who have had a little first aid are guilty of doing the same thing. I think we get more trouble from dislocations than we do from fractures. And I have seen more harm done by the enthusiastic first aid helper and the trainer than anything else.—*George Irving Wright* in the *J. Am. Med. Assn.*, 132:8.

Alum Therapy in Founder

Alum retained its popularity as an internal treatment of founder in horses for many years. Its virtue is quite generally acknowledged, in founder of digestive origin. Its use was based on the sound presumption that its astringency would curtail the absorption of alimentary debris—the suspected cause of the toxemia. Careful observers looked beyond the spectacular laminal symptoms and saw a sick horse. Since the piling up of histamine has been shown to be a pathogenic factor, the trial of alum as an antihistominic, intravenously as well as enterally, might be worth while. The question is open for both experimental and clinical tests to answer.

Animal Diseases and Man

Many diseases of animals are transmitted to man and, consequently, are of great importance in preventive medicine. Of nearly equal importance is the fact that animals may be immunized to agents not pathogenic to man in which antibodies are curative of diseases of man.

Recently it has been demonstrated that a tubercle bacillus peculiar to mice may be used to vaccinate guinea pigs and thus protect them against mammalian tuberculosis. This, of course, suggests the vaccination of man with this mouse type bacillus or some other type of tubercle of animal origin in order to protect man against ordinary tuberculosis.

There are great possibilities in disease prevention from the study of the diseases and immunization of animals. Veterinarians are deeply interested in trends in this and other directions. Some one has well said: "It takes all the running one can do to keep in the same place. If one wants to get anyplace else, one must run twice as fast." Often times we find ourselves in this same predicament.—*H. C. Smith.*

Veterinary Officials Advise FAO on Animal Disease Curbs

Recommendations by a committee of high veterinary officials for better control of animal diseases throughout the world have been accepted by the United Nation's Food and Agriculture Organization.

The Veterinary Committee, assembled at the suggestion of the Director General of the Food and Agriculture Organization, comprised representatives from France, India, Iran, South Africa, United Kingdom, and the United States and UNRRA. The meeting was held in London, in August, 1946. Sir Daniel Cabot, Chief Veterinary Officer of the British Ministry of Agriculture and Fisheries, was chairman. Dr. Harry W. Schoening, chief pathologist of the Bureau of Animal Industry, USDA, was United States representative. The president and director of the International Office of Epizootics, having headquarters in Paris, France, and which serves 43 participating countries, were also in attendance.

The committee urged action along the widest international lines to curb the constant menace of animal diseases to the world's supply of food. One recommendation was the prompt use of new vaccines, chemicals, and similar products of potential veterinary value to obtain an early appraisal of their effectiveness in different countries under varying conditions. Already veterinary officials in East Africa and China are testing the new chick embryo rinderpest vaccine developed by United States and Canadian research workers. The committee also urged joint action by all countries in the control or eradication of diseases that are major threats to the world's food supply.

Another recommendation emphasized the importance of combating not only the highly infectious maladies characterized by spectacular outbreaks but also the many insidious diseases, sometimes overlooked, which in the aggregate cause equally heavy losses.

The value of scientific research as a means of developing improved veterinary strategy against animal ills received frequent mention and strong emphasis in the committee's report. It was also recommended that the Food and Agriculture Organization extend its support to the International Office of Epizootics to enable it to continue and extend its activities in the international control of animal diseases. The committee urged participation in the International Office of Epizootics by countries not yet members, one of which is the United States.

In accepting the recommendations, the Food and Agriculture Organization, which met in Copenhagen in September, included the veterinary group in its standing committee on agriculture. The actions taken do not supplant or interfere with the activities of other veterinary agencies but rather give them added support.

* * * *

What is claimed to be the first report of a case of tularemia contracted from a pheasant appeared in the *Journal of the American Medical Association* August 30, 1946.

* * * *

Survey of Avian Pneumoencephalitis in Illinois

Outbreaks of avian pneumoencephalitis (Newcastle disease) have occurred in six localities in central and northern Illinois. An effort is now being made to determine the extent of this disease in Illinois. Five veterinarians of the State Department of Agriculture, located in separate districts of the state, are prepared to cooperate with practicing veterinarians, flock owners, hatcherymen, farm advisers and feed dealers in examining flocks and getting specimens to the laboratory for examination.

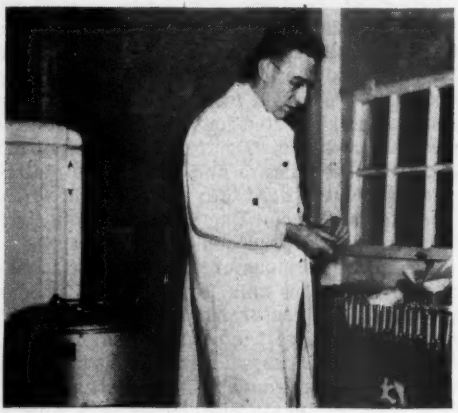
Symptoms.—Generally, severe respiratory as well as nervous symptoms are manifested. In chicks, outbreaks of avian pneumoencephalitis have begun as a respiratory disturbance, characterized by rales, coughing and gasping, indistinguishable from respiratory symptoms observed in infectious bronchitis. Involvement of the central nervous system begins a few days after the onset of the respiratory symptoms. Inability to coordinate voluntary movements, partial or complete paralysis of one or both legs, incoordination of the neck muscles, and tremors of the head and jerky movement, are typical of the nervous symptoms of this disease. Cases with involvement of the central nervous system continue to appear in an affected flock even after respiratory symptoms subside. In older chickens the prominent symptoms are difficult respiration, coughing, gasping, loss of appetite and nervous symptoms similar to those observed in chicks. Mortality may be slight to high. In laying flocks, egg production is markedly reduced and may cease entirely.

Diagnosis.—A positive diagnosis requires laboratory assistance. The laboratories of the College of Veterinary Medicine at Urbana will aid in diagnosis. Typically affected live birds in the early stages of the disease should be delivered promptly by automobile; *not by common carrier.* Poultrymen observing the symptoms mentioned above are urged to consult their local veterinarian and arrange with the district veterinarian for flock inspection and delivery of specimens.

Veterinary Section in U. S. Public Health Service

A Veterinary Public Health Section has been established in the States Relations Division of the U. S. Public Health Service, Federal Security Agency, to conduct demonstration projects on the control of animal diseases communicable to man. This section also will collect epidemiological data pertinent to these diseases.

With increasing investigations being made in the field of animal diseases, the control of communicable diseases which have an animal reservoir has assumed great importance in recent years. Since October, 1945, the States Relations Division has been conducting a study of the relation of animal diseases to human health. This study has resulted in the inaugration of the Veterinary Public Health Section.

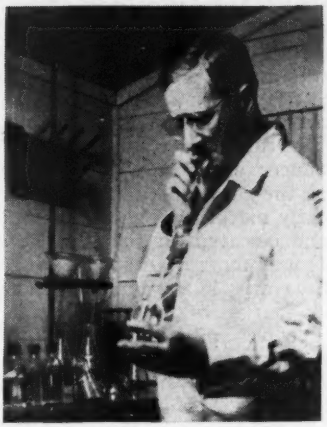


Dr. J. H. Steele (while a senior student) testing blood samples for brucellosis. Following graduation from M. S. C. in 1941, he took a course in the Public Health school at Harvard University after which he accepted a position in public health service in Ohio. Next he spent a year in public health work in Puerto Rico. Returning to Washington, he was assigned to the position of Sanitarian in the U. S. Public Health Service until assigned to his present duties

Heading the new program is Dr. James H. Steele, a veterinarian who also holds a degree in public health. Doctor Steele will be responsible for developing the demonstration projects and for consultant services to States in conducting veterinary public health programs.

Dr. Steele and his staff in Washington will act as consultants to the District Offices of the Public Health Service until the program has progressed sufficiently to provide the assignment of consultants to each District. Dr. Steele's office will also provide special services to state and local health departments at the request of the District Offices.

Patton Goes to China



John W. Patton, B.S.A., D.V.M., M.S.

Dr. J. W. Patton, East Lansing, Mich., has accepted a position with UNRRA as director of the development and production of biological diagnostic prophylactic and therapeutic agents for use in China. His headquarters will be Shanghai; his address c/o UNRRA, Embarkment Bldg., 370 Soochow Rd., Shanghai. It is not expected, however, that he will spend much time in Shanghai. Doctor Patton is well qualified to undertake this work for UNRRA. His experience extends back to World War I when he was engaged in the manufacture of tetanus antitoxin and diphtheria antitoxin at the National Vaccine and Antitoxin Institute, Washington, D. C. Of recent years he has given more attention to research in nutrition than to other phases of biology. At one time or another his experience has encompassed pretty much the whole field of biology

Kuttler Appointed Tuberculosis Eradication Chief

Dr. Abner K. Kuttler, inspector in charge of veterinary field activities of the Bureau of Animal Industry in Illinois, has been appointed head of the Tuberculosis Eradication division of the Bureau.

Doctor Kuttler is a native of Kansas and a graduate of the San Francisco Veterinary College in 1917. He entered the Bureau of Animal Industry in 1917 and has served it continuously since that time with the exception of service in World War I and short periods of active duty in the Veterinary Corps of the Army and as deputy state veterinary inspector in Idaho.

He assumes his new post with a background of experience in responsible positions in many extensive disease-control projects, including the eradication of cattle fever ticks, tuberculosis, brucellosis and sheep scabies. He has participated also in the control of hog cholera and other diseases.

Rate of Growth and Aging of Livestock

Livestock raisers bend every effort to attain rapid growth of their animals. Early maturity is associated with rapid growth. In the dairy cow, the work horse and the hen early maturity possesses the advantage of taking the animals out of the boarder and putting them into the producer class at a younger age than would be the case otherwise.

But early maturity is associated with early aging and cessation of reproductive activity. And this may more than offset the advantage of early maturity in the dairy cow. It takes her till she is four years of age or older to pay for herself in calves and milk. Early aging shortens the productive period.

Thyroxine and stilbestrol appear to slow the aging rate. So does underfeeding but that can hardly be profitable in the dairy cow or in breeding males. That hormonal methods are economically justified is yet to be demonstrated.

Breed Improvement Follows Disease Prevention

The loss of dairy calves from disease is probably the greatest handicap to increasing the production of a herd of dairy cows. So many calves die from disease and neglect in the average dairy herd that those that live are barely adequate in number for the replacement required to maintain the herd. This permits no selection to improve production. The use of improved sires helps to increase production but is a poor substitute for good sires plus careful selection from among the calves and first calf heifers which is possible only where many more calves are raised than are required for replacements for the herd.

What may be accomplished by selection and good feeding in increasing production in an average dairy herd is illustrated by the herd on the Purina research farm at Gray's Summit, Missouri. The herd was founded 20 years ago by purchasing Holstein-Friesian heifers from ordinary dairy herds in the community. No female stock has been added to the herd from outside since the first group of heifers was purchased. Bulls have been purchased from time to time to avoid close in-breeding but no high priced bull has ever been purchased. The object all along has been to operate the herd as a well managed commercial dairy herd should be operated and as, in fact, many such herds are operated.

Excellent sanitation has been maintained in the premises and the best known feeding practices observed. The loss of calves from disease has averaged less than 1% annually, making available approximately three heifer calves from which to select one for replacement. The result: a herd in which the average annual production per cow has been increased from 6000 to 12,000 pounds per cow without the addition of improved blood lines. In addition a lot of money has been saved by not attempting to raise good cows from sick calves sired by fancy-priced bulls.

Research Scientist Discovers Hollow Belly

Dr. C. F. Huffman, Michigan authority on animal nutrition, concluded after years of studying rations that the greatest deficiency in livestock feeding is failure to provide enough roughage and grain to meet the animals' need for calories.

He was called to a Michigan dairy farm to determine why milk production had dropped sharply. The owner was feeding the cows plenty of a standard mixed feed while they were on pasture and suspected some obscure reason for low milk production. Doctor Huffman went out to look at the pasture and advised the dairyman to turn the herd into another field where good pasture was being held to be plowed down for soil improvement.

The change in pasture put the cows back into their normal milk flow. Doctor Huffman remarked that pasture for dairy cows should be good enough so the cows can eat from 100 to 150 pounds of grass a day without becoming long distance runners to gather that much feed. The Michigan State expert in animal nutrition declares there is an unknown factor in young grass and in grains which stimulates milk production, so the probable supply of this factor in the ration should be investigated after the farmer is sure his livestock gets feed enough to provide the needed calories.

This stimulating factor in grass loses its potency as the grass matures, hence dry pasture or late-cut hay does not furnish cows with the essentials for high milk production. For that reason, a grain supplement is required for economic milk production of cows on midsummer and early fall pasture and of cows fed woody hay in the barn-feeding season.

Doctor Huffman says it is not very spectacular for a research worker to report that too little feed and poor quality pasture and hay are the greatest problems in livestock feeding. However, he believes it is impractical to talk too much about cobalt, phosphorus, calcium, or copper deficiencies in livestock feeds when either a few pounds more feed, an improvement in pasture, or an earlier hay-cutting date is more likely to be the right way to correct low milk production.—*The Furrow.*

B. A. I. Inspection of Canned Animal Foods

Canned foods prepared for dogs, cats, and other meat-eating animals may now receive Federal inspection, when packers request and pay for this service. The inspection service includes supervision over sanitary conditions in the plant, the ingredients that go into the can, accurate labeling and various other steps of preparation.

The Department of Agriculture has issued rules and regulations which provide for the inspection and certification under authority of the Research and Marketing Act of 1946, enacted by Congress in August. The new service applies to "canned wet food for dogs, cats, and other carnivora," as distinguished from dry foods such as dog biscuits. To obtain Government certification, the canned product must be "a normal maintenance food," containing

INSPECTION STAMP

This stamp and a number given the establishment must appear on the label

at least 10% protein, 0.3% of calcium and phosphorus, respectively, and 0.15 milligram of thiamin. At least 30% of the product must be meat or meat by-product. Vegetables, grains, or substances derived from them must be of good quality, sound and clean.

Besides containing the name and address of the packer, the label must give the ingredients in the product in the order of their predominance, and the inspection number of each plant must appear on the label. As evidence of U. S. approval, products that meet all official requirements are to be marked with an inspection and certification stamp in the form of a keystone.

The inspection service is to be administered by the Bureau of Animal Industry, USDA, through an Animal Foods Inspection Division. The Department's action in providing such inspection is based on a request and subsequent discussions by members of the American Meat Institute in behalf of canners of animal foods. The manufacture of this class of product now constitutes a large industry for which the establishment of uniform and dependable standards has become desirable.

Here is provided a "seal of approval" that sets a standard a dog food must meet before it can be given the accolade. Further instead of saying what the label shall *not* contain, i.e., palpable lies, this seal provides that it *shall* contain a list of the ingredients in the order of predominance. It will be noted also that this certification of a dog food includes sanitary supervision of the manufacture and that it provides that the ingredients "must be of good quality, sound and clean."

Briefly here is a certification that has a meaning, other than as a device for impressing the laity in advertising. It is the first such certification in the dog food industry.

* * * *

The annual production of creamery butter in the United States increased from 400 million pounds in 1899 to 1½ billion pounds in 1944. Cheese increased during the same period from 300 million pounds to 1 billion pounds. Condensed and evaporated milk from 200,000 pounds to 3¾ billion pounds. Ice cream from 26 million gallons to nearly ½ billion gallons. The products dry nonfat milk solids, dry whole milk, and process cheese, made their appearance in commercial channels during the second decade of the century. The total of all dairy products manufactured in the United States during 1944 was 10¼ billion pounds. For this was used 54¾ billion pounds whole milk and 12 billion pounds skimmilk.—*Certified Milk.*

* * * *

Purebred Livestock Importations in 1946

A total of 25,972 purebred breeding animals were certified for free entry into the United States, during the year ended June 30, 1946. The number was about 16% more than during the previous year. Free entry of purebred livestock intended for breeding purposes is authorized by a provision of the Tariff Act of 1930 which the Department of Agriculture assists custom officials of the Treasury Department in administering.

The principal source of purebred livestock was Canada but smaller numbers were received from Australia, New Zealand and other countries. As in the past, the new arrivals are expected to be used for general improvement of animal types in the United States.

The importations during the last year included 21,482 cattle, 3,062 sheep, 665 dogs, 647 swine and 116 horses. Most of the cattle were of the Holstein-Friesian, Ayrshire, Jersey and shorthorn breeds, although eight other breeds contributed to the total. The sheep were principally Suffolk, Southdown and Hampshire, with eight other breeds represented. The breeds of dogs were not classified. The swine comprised only the Yorkshire, Tamworth and Berkshire breeds. Horses were mainly thoroughbred, standardbred and Clydesdale.

Veterinary Service Improves Native Cattle on the African Gold Coast*

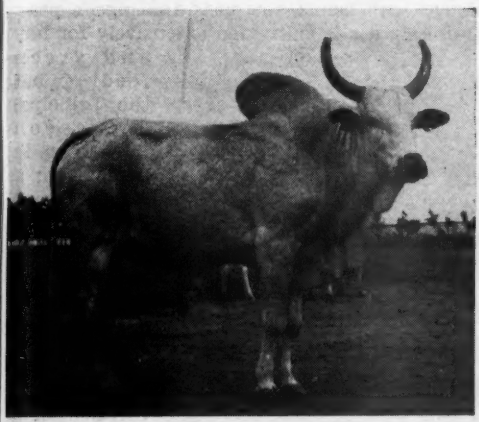
ABOUT 10 years ago all the cattle on the coastal plains to the east of Accra were of the dwarf type sometimes called Muturu or West African Shorthorn. In spite of the large potential market in Accra, very few cattle came from the plains to the abattoirs. This was due to the fact that the cattle were so poor, so slow to mature and were constantly affected with epidemic disease. They were highly susceptible to rinderpest which reduced the herds by almost half every few years. Even when inoculations against rinderpest was introduced, these cattle were difficult to immunize owing to their great susceptibility, and the mortality was high. The native farmer, realizing that a larger type of cattle was necessary to compete in the market with imported cattle from Nigeria and the north, began to buy and introduce into his herd Zebu bulls

A herd of native cattle on the Accra plains, two miles from the Department of Animal Health Livestock Farm near Accra, Gold Coast. The cattle are closed up at night in a simple stockade kraal. The Fulani herdsman's hut alongside the kraal. The kraal is literally feet deep in manure. The cattle get no extra feeding and there is a high calf mortality as the result of the insanitary conditions

One of the young white Fulani bulls with plains cattle. Even at eighteen months old he is far larger than a mature plains cow. The aim of the farmer is to breed a type of animal which has the hardiness of plains cattle and also the larger size and quicker maturing qualities of the white Fulani

*Photos by the West African Photographic Service, Ministry of Information, Accra, Gold Coast, British West Africa. Discussion from the Department of Animal Health Livestock Farm, Accra, Gold Coast, Africa.

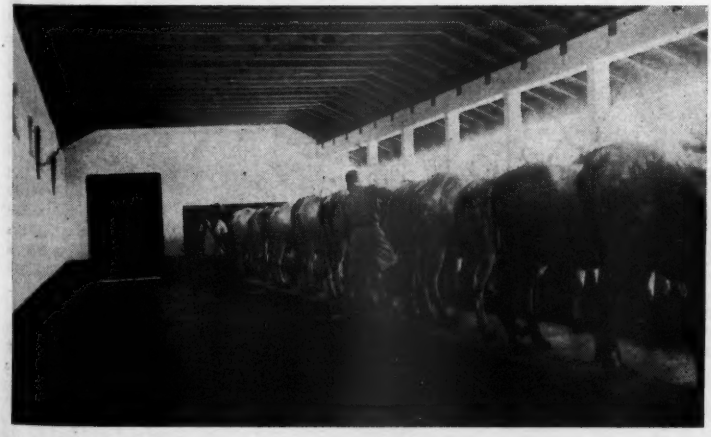
which he brought from Nigeria and Sudan. The good results were soon obvious but, as many of these bulls were not always of the best quality and free of disease such as pleuro-pneumonia, the Government decided to foster this cross breeding by selling to the farmers young bulls of an improved type for crossing with the ordinary plains cows. The purchasing of stud bulls from outside sources was then stopped.



One of the stud bulls. He is a fine specimen of the white Fulani type of Zebu. His sons are issued to the herds on the Accra plains to improve the cattle. His daughters remain on the farm to form replacements for the breeding herd. Thirty young Fulani bulls raised on the Animal Health Livestock Farm were issued in 1945-1946 to the herds on the plains when they became 1½ years old. The farm maintains three stud bulls, which are housed in specially constructed bull pens with ten-foot walls separating them. During the day they graze with the herds of cows. Another type of bull used is a cross between a Fulani cow and a N'Dama bull. This bull retains the best qualities of the two breeds. He is used with the dwarf cows as the young white Fulani bull is too large

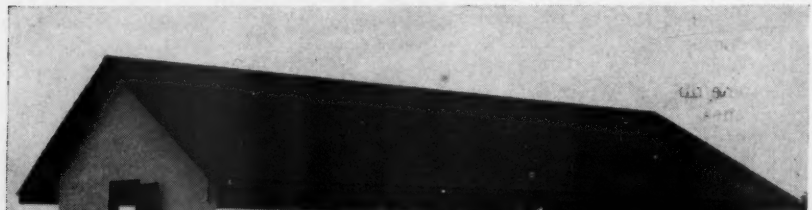
The bulls for issue to the farmers are bred on the Department of Animal Health Livestock Farm near Accra, and the accompanying photographs illustrate modern methods of management of livestock at the farm which are necessary to produce healthy young bulls for issue. The bulls are distributed at 18 months of age and a nominal price of £10

This young white Fulani bull calf on the Department of Animal Health Livestock Farm near Accra, Gold Coast, will in time grow up and be issued to a herd on the plains. The calves are carefully tended from birth and here he is being shown to the visiting veterinary officer by the African veterinary superintendent of the livestock farm



The cows are milked in a modern milking byre at the Department of Animal Health Livestock Farm near Accra, Gold Coast. These are fitted with tubular stall fittings. Milking takes place twice daily. All the liquid manure is trapped and used on the fields and compost pits. Wet brewers grain from a beer brewery is obtained four times per week and is fed in quantities of 15 to 30 pounds per cow, depending on the amount of green grazing available

($40) is charged. This is paid willingly and there is a long waiting list of cattle owners as prospective purchasers. These young bulls, after issue, are inspected at least once each month and, if the owners are found to be neglecting the bulls and allowing them to be covered with ticks or kept in dirty kraals, the bulls are taken from them and given to the next on the list.



The calves are taken to the block of calf pens when they are five days old. The female calves are dehorned soon after birth but the bull calves are not. The calves are penned individually in a block at night and during the heat of the day. They are allowed to exercise in paddocks. Each calf is fed in his own individual pail, which is necessary to control calf disease

On the Livestock Farm, a large acreage of feed crops is under cultivation by modern mixed farming methods. Considerable interest is shown by all farmers attending for instruction in the growing of cereal crops for cattle feeding as these crops are also used for human feeding. Under cultivation are guinea corn, maize, soya beans, cow peas and pigeon peas. Guinea grass is cultivated extensively for hay and green feeding but the principal dry season hay crop is made from a mixture of soya beans and cow peas.

The farm buildings consist of concrete cattle kraals, milking byre, calf pens, bull pens, calving pens, grain and seed stores, silo, disease isolation loose boxes, cattle dip, office and dispensary, implement sheds, stables and large concrete water tanks. Paddocks and electric fences are used to control the grazing.

In addition to livestock improvement, research into disease conditions in cattle is also carried on at the Farm.

A general view of the Department of Animal Health Livestock Farm near Accra, Gold Coast, showing the herd of white Fulani cattle grazing. In these silos of concrete, cereals stored for an indefinite time are not molested by rats nor harmed by dampness. One building is used for a seed store. It is rat proof and attached to it is a mixing shed with engine and grain crusher. Cows calve in a special maternity block of loose boxes. In this way brucellosis is controlled. The cows are placed in the maternity stalls five days before calving and remain with their calves for five days afterward

Some Observations on the Tenacity of Bacillus Anthracis

By C. D. STEIN*
Washington, D. C.

MOST investigators agree that the vegetative form of *B. anthracis* is relatively fragile, while the spores or sporulating organisms are highly resistant to external influences. However, some difference of opinion exists as to sensitiveness of the vegetative form and the resistance of the spores to decomposition, freezing, desiccation, and heat. A brief review of the literature on the effect of heat on anthrax spores and a report of the Bureau's studies on this subject were reported elsewhere.[1]

According to Bongert[2] in carcasses which have laid unopened for two or three days following death, anthrax may be recovered by culture methods, but examination of blood smears from such carcasses after 24 hours is an uncertain method of diagnosis. He has also shown that anthrax bacilli remain alive in unputrefied blood 36 to 50 days, and in putrid blood or tissue, 8 to 20 days.

Dawson[3] was able to recover *B. anthracis* from the blood of anthrax-infected mice, that had been collected a short time after death and held in sealed tubes free of oxygen for 23 days. He also found that the vegetative forms in the spleen of an anthrax-infected guinea pig, collected a short time after death and held at room temperature, were all sporulated within 16 hours.

Momont[4] found that anthrax bacteria without spores contained in dried blood remained viable for more than 60 days at ordinary temperatures.

In studies to determine the length of time the bacillus lives in diagnostic material (animal tissue), Emsbro and Plum[5] reported that bacilli could be demonstrated in the carcasses of mice held at 21° C. for 117 hours, and at 5 to 6° C. until the 308th hour.

Cinca and Fenea[6] have shown that in rabbits, guinea pigs, sheep, and hogs affected with anthrax, when the disease develops slowly, the bacilli are eliminated in the fecal material, and that many of the organisms undergo sporulation and resist putrefaction. They also reported that bacteriological examination of the fecal material is a sure means of making a diagnosis of anthrax, even when cadavers are putrefied and when regular methods give negative results. Dawson,[3] on the other hand, was unable to demonstrate anthrax bacilli in the feces of experimental animals dead of anthrax.

Klepzoff[7] found that the vegetative form of *B. anthracis* was destroyed by freezing at —10° C. in 24 days, and at —24° C. in 12 to 15 days. According to Lehmann, Neumann, and Breed,[8] in cultures of *B. anthracis* on agar held at temperatures of —10° C. to —24° C., most of the bacilli were destroyed in 12 to 24 days, while the few surviving organisms showed a decrease in virulence.

Poppe,[9] on the other hand, has demonstrated that anthrax bacilli in flesh or in cultures remained both viable and virulent after 2 weeks' storage at an average temperature of —15° C.

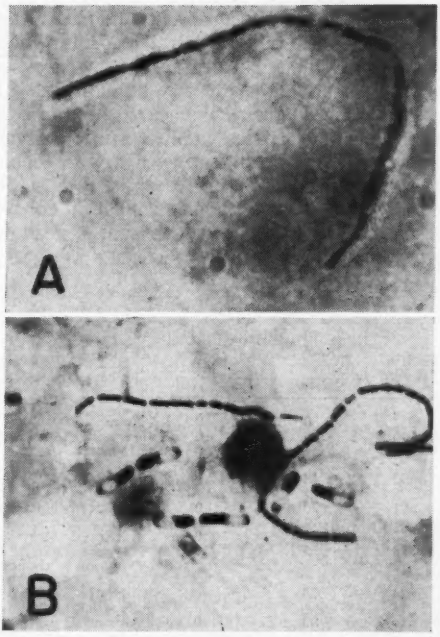


Fig. 1—Anthrax bacilli in stained smears of bone marrow from the femur of unopened carcasses of anthrax-infected guinea pigs held at room temperature, 25° to 30° C. A. Carcass held 48 hours (note long chain of anthrax bacilli). B. Carcass held 75 hours (note chains of *B. anthracis* in presence of large putrefactive anaerobic organisms). X1400

According to McCullough,[10] attempts to attenuate or weaken organisms by severe or repeated freezing and thawing have not proven

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successful. Anthrax organisms which were frozen at —90° F. and thawed in water 24 times in succession remained fully virulent.

Quin[11] also found that alternate freezing and thawing for 24 successive times failed to kill a saline suspension of virulent anthrax organisms from a 12-hour agar growth.

Graham Smith and Further[12] showed that dry anthrax spores kept at room temperature in the presence of light were capable of germinating after 10 years, and in progressively smaller number up to 22 years, but not after 22½ years.

On the other hand, McCullough[10] reported that dry spores kept at room temperature for 40 years were both viable and pathogenic for guinea pigs, while Umeno and Nobata[13] reported that dry spores on cotton threads kept at room temperature in the absence of light for more than 40 years were viable and pathogenic for mice.

Purpose of Experiments

The experiments recorded in this paper were designed to obtain additional information on the fate of the anthrax bacillus in carcasses of animals dead of anthrax, its longevity in tissues collected from such carcasses, and the resistance of anthrax bacillus and its spores to storage at different temperatures to decomposition, desiccation, and freezing, all of which have a practical application in the control, dissemination, and laboratory diagnosis of anthrax.

Effect of Decomposition

In these experiments the effects of rapid and slow decomposition on *B. anthracis* and its ultimate fate in (1) the opened and unopened carcasses of guinea pigs dead of anthrax and (2) in specimens of blood and tissues from animals dead of anthrax were determined.

TABLE II, EXPERIMENT A.—RESULTS OF CULTURE TESTS FOR *B. anthracis* IN UNOPENED CARCASSES OF GUINEA PIGS DEAD OF ANTHRAX, INOCULATED WITH VIRULENT, RECENTLY ISOLATED FIELD STRAIN OF *B. anthracis** AND HELD AT DIFFERENT TEMPERATURES FOR VARYING PERIODS OF TIME

Material Cultured	Guinea Pig 7621 Carcass Held at 25° to 30° C. for 3 Hours Died 9-20-44 Cultured 9-20-44	Guinea Pig 573 Carcass Held at 25° to 30° C. for 75 Hours Died 9-20-44 Cultured 9-23-44	Guinea Pig 6818 Carcass Held at 5° to 10° C. for 4 Weeks Died 9-20-44 Cultured 10-20-44
Peripheral blood	+++	—	+
Heart blood	+++	—	+
Spleen	+++	—	—
Liver	+++	—	—
Muscle	++	—	+
Bone marrow	++	—**	—
Brain	+++	—	++
Feces	+	+	+

*S.D.R.—Strain isolated in 1944, bovine field anthrax.
**Microscopic examination of smears made from bone marrow revealed organisms with the typical morphology of *B. anthracis* but anthrax could not be isolated in culture. (Fig. 1). +++ = luxuriant growth. ++ = moderate growth. + = slight growth. — = no growth.

Microscopic examination and culture tests for the presence of *B. anthracis* were made from the blood and tissues of guinea pigs dead of anthrax after the unopened carcasses had been held for varying periods at room temperature and under refrigeration. The same

TABLE I, EXPERIMENT A.—EFFECT OF RAPID AND SLOW DECOMPOSITION ON *Bacillus anthracis* IN THE UNOPENED CARCASSES OF GUINEA PIGS DEAD OF ANTHRAX

Guinea Pig No.	Time Held At— Room Temp. 25° to 30° C. No. Hours	Time Held At— Refrig. 5° to 10° C. No. Days	Extent of Decomposition in Carcass	Tissues Examined by Culture Tests and Results
6837	6	0	None	Blood, spleen, and liver positive
648	8	0	Very slight	Blood, spleen, and liver positive
650	24	0	Moderate	Peripheral blood, heart blood, spleen, and subcutaneous edema positive
6860	48	0	Marked	*B. anthracis* isolated from suspensions of blood and spleen positive. (See Fig. 1)
691	70	0	Advanced (bloated)	Peripheral blood, heart blood, spleen, and liver negative; bone marrow from femur positive
653	72	0	Advanced (bloated)	Peripheral blood, heart blood, spleen, and liver negative
573	75	0	Advanced; partial liquefaction of tissues	Peripheral blood, heart blood, spleen, liver, muscle, brain, and bone marrow negative, but smears from bone marrow revealed *B. anthracis;* feces** positive
5884	78	0	Advanced; partial liquefaction of tissues	Blood and tissues negative
646	80	0	Advanced; partial liquefaction of tissues	Blood and tissues negative
625	2 to 4	1	None	Peripheral blood, heart blood, spleen, liver, muscle, and bone marrow positive
670	2 to 4	6	Slight	Peripheral blood, heart blood, spleen, liver, and muscle positive. (Many disintegrating organisms and shadow forms were observed in spleen and liver smears)
6796	2 to 4	14	Moderate; spleen very soft	Peripheral blood, heart blood, and muscle positive (very few organisms); cultures made of liver and spleen were negative but disintegrating organisms were observed in smears
696	2 to 4	21	Moderate; blood watery; spleen semi-liquefied	Peripheral blood and heart blood positive (very few organisms); brain positive (numerous organisms); lungs, spleen, liver, muscle, and bone marrow negative
6818	1	28	Marked; tissues soft, some semi-liquefied	Peripheral blood and heart blood positive (very few organisms); brain and feces** positive; spleen, liver, muscle, and bone marrow negative

**Suspension of feces in normal saline, heated at 65° C. for one hour and seeded on plain agar plates

examination was also made of specimens of blood and tissue collected from guinea pigs a short time following death from anthrax. The effects of rapid decomposition were determined on the material held at room temperature (25° to 30° C.) and for slow decomposition on that held under refrigeration at 5° to 10° C. The results of these tests are reported under experiments A, B, C and D, and are given in Tables I, II, III, IV and V.

In experiment A, the results of which are shown in Tables I and II, it was demonstrated that *B. anthracis* could not be isolated by culture tests of blood and tissues from the carcasses of guinea pigs that had been held *unopened* at room temperatures of 25° to 30° C. for 78 hours or longer following death from anthrax, and that under the same conditions the organisms could be isolated only with difficulty from carcasses that had laid unopened for 48 hours (Fig. 1). On the other hand, *B. anthracis* could be recovered from such *unopened* carcasses when held under refrigeration at 5° to 10° C. for at least four weeks (Fig. 2). In this connection Andrjevski[14] has shown that the principal gases of putrefaction, CO_2, H, CH_4, NH_3, and H_2S, bring about the destruction of the anthrax bacillus in putrefying *unopened* carcasses, while non-volatile substances play no part in the process. He further demonstrated that of the gases mentioned, the latter, hydrogen sulfide has the most destructive effect on *B. anthracis*, and suggested its use for the treatment of carcasses of animals dead of anthrax to decrease the danger of spreading the infection. These results appear to indicate that the vegetative organisms in the carcasses of animals dying of anthrax during the summer months are destroyed by anaerobic decomposition after the carcasses have lain unopened for three to four days, whereas the organism may persist for at least four weeks in the unopened carcasses of such animals dying during the winter months.

The fact that the vegetative organisms are destroyed in a few days by anaerobic decomposition in the *unopened* carcasses of animals dead of anthrax during the hot months of summer is no reason why such carcasses should not be sprayed with fly repellents and promptly disposed of by deep burial, or preferably by complete incineration. The skin on such carcasses, especially adjacent to the natural openings, is apt to be contaminated with anthrax spores and the fecal matter may contain spores. Furthermore, if proper disposal of such carcasses is not made promptly, flying

TABLE III, EXPERIMENT B.—COMPARISON OF THE PERSISTENCE OF *B. anthracis* IN OPENED AND UNOPENED CARCASSES OF GUINEA PIGS DEAD OF ANTHRAX HELD AT 25° TO 30° C. FOR FIVE DAYS AND AT 5° TO 10° C. FOR TWENTY DAYS

Guinea Pig No.	Date Died	Status of Carcass	Days Held	Storage Temperature	Results of Culture Tests
	1944				
19	12/23	Opened	5	25° to 30° C.	1st day, when carcass was opened, heart blood, spleen, and liver were positive. 5th day, heart blood, peripheral blood, and liver showed mixed growth but anthrax was isolated by heating saline suspension for 1 hour at 60° C. Blood swab collected 1st day was still positive 28th day.
99	12/23	Unopened	5	25° to 30° C.	5th day, when opened, carcass showed extensive decomposition and was distended with gas; spleen was liquefied; cultures made from peripheral blood, heart blood, liver, muscle, brain, and bone marrow were negative.
117	12/23	Opened	20	5° to 10° C.	1st day, when carcass was opened, heart blood, spleen, and liver were positive. 20th day, brain positive; heart blood, peripheral blood, spleen, liver, muscle, and bone marrow were negative. Blood swab made on 1st day and held at room temperature was still positive.
909	12/23	Unopened	20	5° to 10° C.	20th day, when opened, carcass showed moderate decomposition; spleen was very soft; peripheral blood from axillary space and brain was positive but smears showed very few organisms; heart blood, spleen, liver, muscle and bone marrow were negative. (Fig. 2)

TABLE IV, EXPERIMENT C.—PERSISTENCE OF *B. anthracis* IN BLOOD AND TISSUE SPECIMENS STORED AT ROOM TEMPERATURE (25° TO 30° C.)

Guinea Pig No.	Material	Date Collected	Last Culture Tests		Approximate No. Months Organisms Remained Viable
			Date	Results	
8763	Blood	6-4-44	3-2-45	Positive	9
19	Blood	12-31-44	3-2-45	"	2
1173	Blood	12-31-44	3-2-45	"	2
900	Blood	6-17-44	3-2-45	"	9
432	Blood	1-22-45	3-2-45	"	1
44	Blood	3-8-46	8-14-46	"	5
8763	Muscle	6-4-44	1-20-45	"	7
625	Muscle	7-23-44	1-20-45	"	6
625	Bone marrow	7-23-44	1-20-45	"	6
625	Liver	7-23-44	1-20-45	"	6
625	Spleen	7-23-44	11-7-44	"	3

TABLE V, EXPERIMENT D.—PERSISTENCE OF *B. anthracis* IN BLOOD AND TISSUE SPECIMENS STORED UNDER REFRIGERATION AT 5° TO 10° C.

Guinea Pig. No.	Material	Date Collected	Final Culture Tests		
			Date	No. of Days	Results
SDR-44	Blood swab	3-8-46	8-14-46	159	Positive
2574	Blood swab	7-15-46	8-14-46	29	Positive
8763	Blood	6-9-44	7-29-44	35	Positive
8763	Spleen	6-9-44	6-23-44	14	Positive
			7-14-44	35	Negative
8763	Liver	6-9-44	7-3-44	24	Positive
			7-14-44	35	Negative
7621	Muscle	7-20-44	10-5-44	16	Negative
7621	Spleen	7-20-44	10-5-44	16	Negative
7621	Liver	7-20-44	10-5-44	16	Negative
7621	Kidneys	7-20-44	10-5-44	16	Positive
7621	Bone marrow	7-20-44	10-5-44	16	Negative
6837	Liver	5-1-44	5-12-44	11	Positive
			5-20-44	19	Negative
6837	Spleen	5-1-44	5-9-44	8	Positive
			5-12-44	11	Negative
432	Blood swab	1-22-45	3-2-45	39	Positive
432	Spleen swab	1-22-45	3-2-45	39	Negative
203	Blood swab	1-23-45	3-2-45	38	Positive
203	Spleen swab	1-23-45	3-2-45	38	Negative
841	Blood swab	1-20-45	3-2-45	37	Negative
841	Spleen swab	1-20-45	3-2-45	37	Negative
841	Liver swab	1-20-45	3-2-45	37	Negative

insects and carrion-eating birds such as buzzards, coyotes, dogs, and other carnivorous animals, may feed on the carcasses and thus spread the infection.

In experiment B, the results of which are given in Table III, the comparative persistence of *B. anthracis* in opened and unopened carcasses of guinea pigs dead of anthrax, which were held five days at 25° to 30° C. and 20 days at 5° to 10° C., was studied. In this experiment *B. anthracis* was recovered from the tissues of an *opened* carcass held for five days at 25° to 30° C., but the tissues in an *unopened* carcass held at the same temperature for the same length of time were negative on culture tests for *B. anthracis*.

In the *opened* carcass of a guinea pig held 20 days at 5° to 10° C. and placed in the ice box immediately after being opened, *B. anthracis* was recovered from the brain only. The heart blood, peripheral blood, spleen, liver, muscle, and bone marrow were negative for anthrax. In the *unopened* carcass held under identical conditions, *B. anthracis* was isolated from the peripheral blood and brain but not from the other tissues (Fig. 2).

The results of this experiment indicate that sporulation of the organism occurring in the tissues of *opened* carcasses held for five days at room temperature accounted for their persistence, while anaerobic decomposition killed the organisms in tissue of the *unopened* carcasses held under the same conditions. In the *opened* carcasses held 20 days at 5° to 10° C., it is highly probable that little or no sporulation occurred which, together with slow decomposition, accounted for the scarcity of live organisms in the tissues, while in the *unopened* carcasses the vegetative organisms were being gradually destroyed by slow decomposition under anaerobic conditions.

The difficulty in making a definite diagnosis of anthrax from specimens collected from carcasses undergoing decomposition has been set forth in a previous article by the author,[15] and is well illustrated by the following incident:

During July, 1944, two swab specimens from cases of suspected anthrax, collected on the same day by the same veterinarian on separate farms, were received for examination by this laboratory on the same date. The first specimen was from a cow that had died five or six hours previous to the collection of the specimens. In this case a positive diagnosis of anthrax by culture and animal inoculation tests was made in less than 48 hours. The second specimen was from the carcass of a cow that had been dead for more than 36 hours and showed considerable decomposition. Preliminary culture tests were negative for anthrax, but guinea pigs inoculated with saline suspensions from the swab died in less than 24 hours from an anaerobic infection. Cultures made from heart blood of these animals were likewise negative for anthrax. On further study we were able to isolate *B. anthracis* from the point of inoculation in the guinea pigs that died of anaerobic infection and also by culture tests by treating swab suspensions with phenol before plating. In this case, therefore, which was negative to the usual preliminary

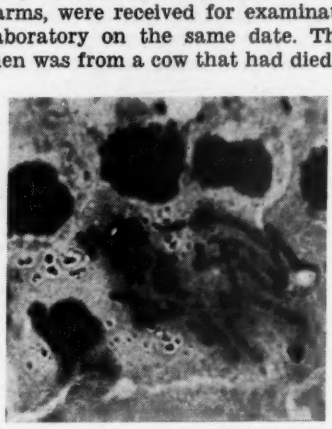

Fig. 2—Anthrax bacilli in stained blood smears from axillary space of the unopened carcass of an anthrax-infected guinea pig held in ice box at 5° to 10° C. for 20 days. X1400

TABLE VI.—RESULTS OF CULTURE TESTS FOR THE PRESENCE OF *B. anthracis* IN THE URINE AND FECES OF GUINEA PIGS DEAD OF ANTHRAX

Number Tested	Time Held (Hours)	Storage Temperature	Results of Culture Tests on—					
			Tissues		Urine		Feces*	
			Pos.	Neg.	Pos.	Neg.	Pos.	Neg.
8	1 to 3	25° to 30° C.	8	0	7	1	2	6
4	4 to 7	"	4	0	4	0	0	4
3	12 to 15	"	3	0	2	1	0	3
1	24	"	1	0	1	0	1	0
1	32	"	1	0	1	0	0	1
1	36	"	1	0	1	0	0	1
1	72	"	1	0	1	0	1	0
1	75	"	0	1	0	1	1	0
1	24	5° to 10° C.	1	0	1	0	1	0
5	48	"	5	0	1	4	0	5
1	456	"	1	0	0	1	0	1
1	720	"	1	0	0	1	1	0
Total 28			27	1	19	9	7	21

*Fecal samples suspended in normal saline and heated one hour at 65° C. before making cultural tests for the presence of spores.

examination, and at least 96 hours elapsed before a positive diagnosis could be made.

In experiment C, the results of which are shown in Table IV, tests were made to determine the persistence of *B. anthracis* in blood and tissue specimens kept at room temperature (25° to 30° C.). In the specimens collected from the carcasses of anthrax-infected guinea pigs, a few hours following death and held at room temperature, it was possible to isolate *B. anthracis* from the blood after one to nine months' storage; from muscle, after six to seven months' storage; from liver and bone marrow, after six months' storage; and from the spleen, after three months' storage. The anthrax organisms in these tissues had sporulated before decomposition set in, and in the spore state had resisted subsequent drying and putrefactive changes occurring in the tissues at room temperature (Fig. 3).

The results of this experiment indicate that the anthrax organisms contained in hides, meat, and other tissues taken from the carcass of an animal dead of anthrax and intended for use as food for man or animals, or for the production of wearing apparel for man, may sporulate and persist in such material for weeks or months.

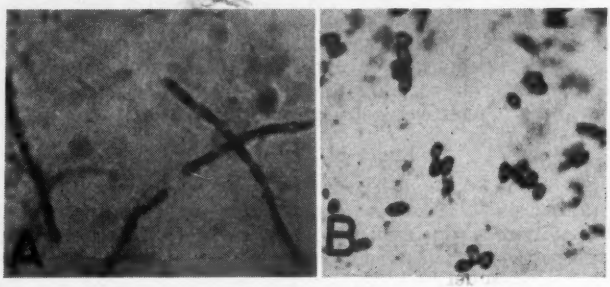

Fig. 3—A. Chains of sporulating anthrax bacilli in stain smears from infected spleen tissue held 72 hours at romo temperature. X1400. B. Anthrax spores in stained smear from an anthrax spore suspension. X1900

In experiment D, the results of which are shown in Table V, tests were made to determine the persistence of *B. anthracis* in blood and tissue specimens stored in the refrigerator (5° to 10° C.). The vegetative organisms contained in the spleen, liver, kidneys, and muscle from anthrax-infected guinea pigs, when collected a short time following death

TABLE VII.—SUMMARY OF RESULTS OBTAINED BY SUCCESSIVE RAPID FREEZING AT —72° TO —77° C. AND THAWING AT 37.5° C. OF *B. anthracis* AND ITS SPORES

Type of Anthrax Material Treated				Results of Culture Tests Before Freezing	No. Times Frozen and Thawed	Results of Culture Tests After Freezing and Thawing	Remarks
Strain	State of Growth	Type of Suspension	Percent of Blood				
SDR-44	Vegetative	Suspension of blood in normal saline from guinea pigs dead of anthrax	2	++	4	—	Vegetative organisms in blood suspension destroyed*
NCP-1	"	"	2	++	4	—	" *
SA-NS	"	"	2	++	5	—	" *
SD-2	"	"	2	++	6	—	" *
SD-43	"	"	4	++	12	—	"
SD-44	"	"	5	++	18	—	" *
NC-46	"	"	10	+++	20	+	Very few organisms survived. Virulence reduced, killed 1 of 2 guinea pigs**
SA-NS	"	Suspension of 18-hour agar growth from asporogenic strain in normal saline		+++	15	—	All organisms rendered nonviable after 15 freezings*
SAf-1	Sporulating	Suspension of 18-hour agar growth from sporulating strain in normal saline		+++	15	+++	Most of the organisms remained viable
SA-NS	Vegetative	18-hour broth culture of an asporogenic strain		+++	10	—	All organisms rendered nonviable*
NC-46	Sporulating	18-hour broth culture of a sporulating strain		+++	20	+	Most organisms destroyed. Virulence reduced, failed to kill guinea pigs*
NCP	"	22-hour broth culture of a sporulating strain		+++	30	+++	Most organisms remained viable
SDR-44	"	24-hour broth culture of a sporulating strain		+++	30	+++	" **
SDR-44	Spores	Suspension of spores in normal saline from dried blood swab from bovine field case		+++	30	+++	Failed to destroy spores**
SD-43	"	"		+++	45	+++	"
SD-1	"	Suspension of spores from agar culture of a virulent field strain		+++	45	+++	" **

*Nonpathogenic for guinea pigs. **Pathogenic for guinea pigs in 48 to 72 hours.
+ = little growth, very few colonies. ++ = moderate growth, limited number of colonies. +++ = heavy growth, numerous colonies. — = no growth, no colonies.

and immediately placed in the refrigerator at 5° to 10° C., gradually died, so that anthrax organisms could be isolated from these tissues after 14 to 24 days' storage but not after 35 days' storage. However, in some blood specimens collected on cotton swabs and held under these conditions, it was possible to isolate anthrax after 35 to 159 days' storage. The failure of the anthrax organisms in tissues undergoing slow decomposition to persist for long periods at a temperature of 5° to 10° C. was no doubt because little or no sporulation occurs at temperatures below 15° to 18° C.

Isolation of *B. Anthracis* from Urine and Feces

In this experiment, culture tests were made for the presence of vegetative forms of *B. anthracis* in the urine and for spores in the fecal matter from guinea pigs dead of anthrax that had been held for varying periods at room temperature (25° to 30° C.) or in the refrigerator (5° to 10° C.).

The fecal matter was obtained from the cecum and colon after searing and puncture with a hot platinum spatula. A suspension of the fecal matter in normal saline was heated for one hour at 65° C. and then seeded on plain agar plates and into nutrient broth. The urine was obtained by aspirating a small amount with a sterile syringe after first lightly searing the bladder with a hot platinum spatula and puncturing with a hypodermic needle. The urine so collected was seeded directly onto plain agar plates and into nutrient broth.

The results of this experiment are given in Table VI, and indicate that vegetative forms of *B. anthracis* occur fairly regularly in the urine of guinea pigs dead of anthrax but that spores can be demonstrated only rarely in the fecal matter of such animals. The vegetative organisms were demonstrated in 19 of the 28 urine samples examined and spores in only seven of 28 fecal samples tested. Five of the latter samples were obtained from guinea pigs that had been dead 24 hours or longer. In one guinea pig that had lain unopened for 75 hours, in which *B. anthracis* could not be isolated from the blood or tissues, spores were recovered from the fecal material (Fig. 4).

Effect of Repeated Rapid Freezing and Thawing

In these experiments the materials tested were repeatedly subjected to alternate rapid shell freezing at —72° C. to —77° C. and thawing at 37.5° C. The refrigerant used was an alcohol dry-ice mixture contained in a glass-lined thermos jar. Small pyrex flasks containing 5 to 15cc of the material to be tested were immersed in the refrigerant and slowly rotated to produce rapid shell freezing. Following freezing, the flasks were immediately immersed in a water bath to produce thawing. It required from one to 3½ minutes to shell freeze and from two to five minutes to thaw, depending upon the amount of material in the flasks. Culture tests with beef infusion

TABLE VIII.—EFFECT OF CONTINUOUS FREEZING AT —60° TO —70° C. ON *B. anthracis* AND ITS SPORES

Type of Material Placed in Storage	Results of Culture Test Previous to Storage	Date Placed in Storage	Culture Test for Anthrax (A) Sample 1 Date	Sample 1 Results	Sample 2 Date	Sample 2 Results	Sample 3 Date	Sample 3 Results	Remarks
Whole spleen from anthrax-infected guinea pig killed with No. 2 spore A	+++	5-1-44	8-2-44	—					No viable organisms after 90 days*
Blood in normal saline from anthrax-infected guinea pig killed with field strain SDR-44	++	8-17-44	9-18-44	++	10-17-44	+	11-17-44	+	Only a few organisms viable after 90 days
24-hour broth culture (sporulating) strain SDR-44	+++	"	"	+++	"	+++	"	+++	Organisms remained viable for 90 days
Suspension of spores from agar slant, strain SDR-44	+++	"	"	+++	"	+++	"	+++	"
Spleen tissue from anthrax-infected guinea pig killed with field strain SDR-44	+++	"	"	+++	"	+++	"	+++	"
Blood in normal saline from anthrax-infected guinea pig killed with No. 2 spore A	++	"	11-17-44	—					No viable organisms after 90 days
Whole spleen from anthrax-infected guinea pig killed with No. 2 spore B	+++	"	"	+++					Organisms remained viable for 90 days
Blood in normal saline from anthrax-infected guinea pig killed with strain SD-2	++	8-26-44	12-18-45	+					Very few organisms viable after 124 days
20-hour broth culture (sporulating) strain SD-2	+++	"	"	+++					Organisms remained viable for 124 days
Blood in normal saline from anthrax-infected guinea pig killed with strain NC-P	++	"	"	—					No viable organisms after 124 days
20-hour broth culture (sporulating) strain NC-P	+++	"	"	+++					Organisms remained viable for 124 days

(A) Nutrient broth, agar slants and agar plates used in culture tests. *Nonpathogenic for guinea pigs.
+ = little growth, very few colonies. ++ = moderate growth, limited number of colonies. +++ = heavy growth, numerous colonies. — = no growth, no colonies.

broth and plain agar plates were made on samples of the treated material subsequent to every two to five freezings and thawings. Samples from different types of the material treated were also selected for pathogenicity tests on guinea pigs.

The materials tested consisted of (1) vegetative organisms contained in 2% to 10% suspensions of blood in normal saline from the carcasses of anthrax-infected guinea pigs collected a short time following death, (2) saline suspensions of spores from dried blood swabs made direct from bovine field cases of anthrax, (3) saline suspension of spores made from agar cultures of virulent bovine anthrax, (4) 18-hour, 22-hour, and 24-hour broth cultures of sporulating and non-sporulating strains of *B. anthracis*, (5) saline suspension of 18-hour agar culture from sporulating and asporogenic strain. A summary of the results obtained in these experiments is given in Table VII.

In these experiments, the vegetative forms of *B. anthracis* contained in 2% to 5% suspensions of blood from anthrax-infected guinea pigs in normal saline collected soon after death were destroyed by four to 18 successive rapid freezings and thawings. Microscopic examination of the blood suspensions following the freezing and thawing showed poorly stained organisms, disintegrating organisms, and shadow forms (Fig. 5). Samples of the treated blood, when injected into guinea pigs, failed to produce anthrax and apparently possessed no immunizing value against the disease since such animals, when exposed to anthrax, promptly developed the infection. However, in a 10% suspension of blood in normal saline from an anthrax-infected guinea pig, all but a few of the vegetative organisms were destroyed by freezing and thawing 20 consecutive times. The virulence also appeared to be reduced since it killed only one of the two guinea pigs injected.

The organisms of an asporogenic strain in (1) an 18-hour broth culture were destroyed by 10 successive freezings and thawings, and (2) in a saline suspension from an 18-hour agar culture by 15 successive freezings and thawings. The organisms in a normal saline suspension of one sporulating strain from an 18-hour agar culture resisted freezing and thawing for 15 consecutive times, while the organisms in an 18-hour broth culture from another sporulating strain, which were greatly reduced in number by 20 successive freezings, were still viable but not pathogenic for guinea pigs. On the other hand, 22- and 24-hour broth cultures of different sporulating strains of *B. anthracis* resisted rapid freezing and thawing for 30 successive times, and suspensions of spores made from bovine blood swabs or from agar slant cultures resisted the same treatment for at least 45 consecutive times. Pathogenicity tests on guinea pigs with broth cultures of sporulating strains and spore suspensions, following freezing and thawing from 30 to 45 successive times, indicated that they were still fully virulent.

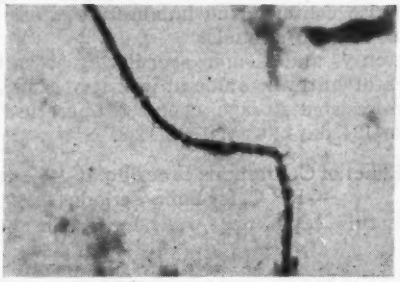

Fig. 4—Encapsulated chain of anthrax bacilli in stained urine smear from an anthrax-infected guinea pig about six hours after death. X1400

Effect of Continuous Freezing at —60° to —70° C. of *B. Anthracis* and Its Spores

In this experiment, blood suspensions in normal saline and spleen tissue taken from guinea pigs a short time following death from anthrax, spore suspensions, and sporulating cultures were placed in tightly corked glass containers which, in turn, were placed in metal mailing tubes with screw tops. The samples were then immediately stored in a dry-ice chest at a temperature of —60° to —70° C. for varying periods and tested for anthrax.

The vegetative organisms in blood suspensions from two anthrax-infected guinea pigs were destroyed in 90 and 124 days, respectively, and in similar material from two different guinea pigs all but a few of the organ-

TABLE IX.—EFFECT OF CONTINUOUS FREEZING AT —5° TO —10° C. FOR LONG PERIODS

Lot and Strain No.	Time stored at —5° to —10° C.	Yrs.	Mos.	Results of Test for Viability	Results of Test for Virulence on Guinea Pigs
Lot 1 Strain 1864-A	April, 1933, to January, 1944	10	8	Positive	Killed in less than 72 hrs.
Lot 2 Strain 1864-B	February, 1934, to January, 1944	9	11	"	"
Lot 3 Strain 1864-C	August, 1934, to January, 1944	9	4	"	"
Lot 4 Strain 1864-D	September, 1934, to January, 1944	9	3	"	"

isms were destroyed in 90 and 124 days, respectively.

The vegetative organisms in spleen tissue from one guinea pig were destroyed in 90 days, while the same material from two other guinea pigs remained viable for 90 days.

A saline suspension, prepared from the spleen tissue in which the organisms were destroyed by freezing at —60° to —70° C., was nonpathogenic when injected into guinea pigs and also conferred no immunity against anthrax in such animals.

Twenty- and 24-hour sporulating broth cultures of anthrax and anthrax spore suspensions resisted storage at this temperature for 90 to 124 days (Table VIII).

Effect of Continuous Freezing at —5° to —10° C. for Long Periods

In this experiment, 18-hour serum broth cultures of sporulating strains of *B. anthracis*, after being held in storage for varying periods at —5° to —10° C., were tested for viability and virulence. The results of these tests are given in Table IX, and indicate that such cultures of sporulating strains of *B. anthracis*, when held in a frozen state at —5° to —10° C. for nine years and three months to 10 years and eight months, were both viable and virulent for guinea pigs.

In connection with the resistance of bacteria to low temperatures and freezing, Rahn[16] has pointed out that at 5° to 10° C. above the freezing point, most organisms cease to grow but die very slowly, and organisms that survive the freezing process also die very slowly if kept in the frozen state. He also mentions that bacteria, yeast cells, and mold spores have been known to survive for several years in a frozen state, and concludes it is impossible to sterilize foods or even water by freezing.

Hilliard and Davis[17] have shown that certain organisms such as *Eberthella typhosa* and *Serratia marcescens* can be killed by five successive freezings and thawings, while all but a small percentage of the same organisms resist continuous freezing for four days.

Luyet and Gehenio[18] have shown that rapid thawing following rapid freezing at very low temperature is less injurious to bacteria than slow thawing.

Longevity of Attenuated Anthrax Spores Stored in the Refrigerator at 5° to 10° C.

In this experiment, attenuated anthrax spores of different degrees of virulence, contained in sterile meal or suspended in a solution of normal saline and glycerin with or without the addition of 2% saponin or 2% alum, were tested for viability and virulence after long storage in the refrigerator at 5° to 10° C. For results of this test see Table X.

All the eight samples tested, which had been stored at 5° to 10° C. for periods varying from eight to 14 years, contained viable spores, and seven of the eight samples were pathogenic for guinea pigs in two to five days in 1cc doses subcutaneously. Six of the suspensions showed a moderate decrease in live spore content, while two of the suspensions showed a marked decrease. One of the latter was a No. 2 spore in normal saline containing 40% glycerin which had been stored for 13 years and also

TABLE X.—TESTS ON THE LONGEVITY OF ATTENUATED ANTHRAX SPORES STORED AT 5° TO 10° C.

Virulence of Spore	Type of Spores	Year Prepared	Time Stored at 5° to 10° C. (years)	Results of Test for Viability	Results of Tests for Virulence on Guinea Pigs (1cc Subcutaneously)
	Spores suspended in normal saline containing—				
No. 2	40% glycerin	1932	13	+	Failed to kill in 20 days
No. 2	" "	1934	11	++	Killed in 4 days
No. 2	" "	1931	14	++	Killed in 5 days
No. 2	40% glycerin 2% saponin 40% glycerin	1934	11	++	Killed in 3 days
No. 2	2% potassium alum	1936	9	+	Killed in 5 days
No. 3	10% glycerin	1932	13	+++	Killed in 2 days
No. 4	" "	1933	12	+++	Killed in 3 days
No. 2	Dry spores in sterile meal	1936	8	++	Killed in 4 days

+ = very few colonies. ++ = limited number of colonies. +++ = numerous colonies.

TABLE XI.—RESULTS OF TESTS ON DRY ANTHRAX SPORES IN BLOOD SWAB FIELD SPECIMENS FOR VIABILITY AND VIRULENCE

Number Swabs Tested	Source of Blood Swab Specimen	Year Collected	Time Held at 25° to 30° C. (Years)	Results of Culture Tests for Viability	Results of Pathogenicity Tests on Guinea Pigs
4	Bovine field cases, S. Dakota and N. Carolina	1943	1	Positive	Killed in 48 to 72 hours
5	Bovine field cases, N. Carolina	1942	2	"	"
7	Bovine field cases, S. Dakota and N. Carolina	1941	3	"	"
4	Bovine field cases, S. Dakota	1937	5	"	"
4	"	1937	5¼	"	"
2	Equine field cases, S. Dakota	1937	5½	"	"
4	Bovine field cases, S. Dakota	1937	6	"	"
20	"	1937	7	"	"
6	"	1937	9	"	"

are given in Table XI, and indicate that spores contained in such swabs remained both viable was nonpathogenic for guinea pigs, while the other was a No. 2 spore in normal saline containing 40% glycerin and 2% potassium alum which had been stored for nine years but was pathogenic for guinea pigs in five days.

Longevity of Dry Spores at Room Temperature

In this experiment, the dry spores contained on blood swabs collected direct from field cases of anthrax were tested for viability and virulence after the swabs, which were contained in corked glass vials, had been held for varying periods in the presence of light in a glass-front cabinet at room temperature of 25° to 30° C. The summarized results of these tests

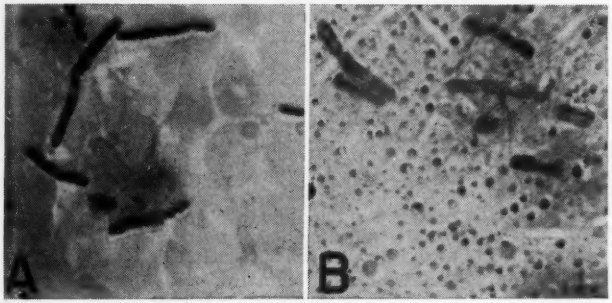

Fig. 5—A. Stained smear from 5% blood suspension from anthrax-infected guinea pig, before being subjected to rapid freezing and thawing. (Note well stained viable organisms.) B. Stained smear from same suspension after alternate rapid freezing at —72° to —77° C. and thawing at 37.5° C. for 15 consecutive times. (Note the poorly stained nonviable organisms and shadow forms.)

and virulent for guinea pigs from one to nine years.

Summary

The literature on the tenacity of *B. anthracis* is briefly reviewed. In experiments to determine the longevity of the anthrax bacillus in the carcasses of guinea pigs dead of anthrax and in the tissues from such animals, it was demonstrated:

1. That with the exception of the fecal matter, which sometimes contains spores, the vegetative form of *B. anthracis* in *unopened* carcasses of guinea pigs dead of anthrax, when held at room temperature (25° to 30° C.), is rapidly destroyed by the anaerobic organisms, producing putrefaction in the unopened carcass. After 72 to 80 hours few, if any, anthrax bacilli remain alive in the *unopened* carcass held at 25° to 30° C. or higher, and after 48 hours under the same conditions the organisms can be isolated only with difficulty.

2. That, on the other hand, in the *unopened* carcasses of anthrax-infected guinea pigs held at ice-box temperature (5° to 10° C.) decomposition occurs at a slow rate and the anthrax organisms decrease in number and die slowly so that they may be recovered at least four weeks after storage at such temperatures.

3. That if carcasses of guinea pigs dead of anthrax and held at room temperature are opened before decomposition sets in, the vegetative forms will sporulate, resist subsequent drying and putrefactive changes, and in some of the tissues removed from such carcasses will persist for long periods. In tissues collected and stored under these conditions, it was possible to isolate *B. anthracis* from blood after one to nine months, from muscle after six to seven months, from liver and bone marrow after six months, and from spleen after three months.

4. That vegetative anthrax organisms contained in tissues, except blood, from anthrax-infected guinea pigs, when collected a short time following death and immediately placed in the refrigerator at 5° to 10° C., gradually die apparently because little or no sporulation occurs below 15° to 18° C. Tissue specimens collected and stored under these conditions were positive for anthrax after 14 to 24 days' storage but not after 35 days' storage. Blood specimens, however, collected and held under the same conditions were positive for anthrax from 35 to 159 days.

It was demonstrated that *B. anthracis* can be isolated fairly regularly from the urine of guinea pigs dead of anthrax, but that spores can be recovered only rarely from the fecal matter of such animals. Of 28 cases examined, vegetative organisms were found in the urine of 19 but spores were found in the fecal matter of only seven.

In experiments to determine the resistance of *B. anthracis* and its spores to repeated alternate freezing at —72° to —77° C. and thawing at 37.5° C., it was demonstrated:

1. That the vegetative forms of *B. anthracis*, contained in 2% to 5% suspensions of blood from anthrax-infected guinea pigs in normal saline, were destroyed by four to 18 successive freezings and thawings.

2. That such material was nonpathogenic for guinea pigs and possessed no immunizing value.

3. That, in a 10% suspension of the same material, all but a few organisms were destroyed by freezing and thawing 20 consecutives times and the virulence was decreased.

4. That the organisms of an asporogenic

strain from an 18-hour broth culture and from an 18-hour agar culture were rendered nonviable by 10 and 15 such treatments, respectively.

5. That the organisms in one sporulating strain from an 18-hour agar culture resisted the treatment for 15 consecutive times, while the organisms in an 18-hour broth culture from another sporulating strain were greatly reduced in number and nonpathogenic for guinea pigs.

6. That 22- and 24-hour broth cultures of sporulating strains resisted the treatment for 30 successive times.

7. That spore suspensions from blood swabs or agar slant culture resisted the treatment for at least 45 consecutive times.

In experiments to determine the effect of continuous freezing at —60° to —70° C., it was demonstrated:

1. That the vegetative organisms in blood suspensions from two anthrax-infected guinea pigs were destroyed in 90 to 124 days, respectively, and in similar material from two different guinea pigs all but a few of the organisms were destroyed in 90 and 124 days, respectively.

2. That the vegetative organisms in spleen tissue from one guinea pig were destroyed in 90 days, while the same material from two other guinea pigs remained viable for 90 days.

3. That the saline suspension, prepared from the spleen tissue in which the organisms were destroyed by freezing at —60° to —70° C., was nonpathogenic when injected into guinea pigs and also conferred no immunity against anthrax in such animals.

4. That 20- and 24-hour broth cultures of sporulating strains of *B. anthracis* and anthrax spore suspensions resisted storage at this temperature for 90 to 124 days.

Eighteen-hour serum broth cultures of sporulating strains of *B. anthracis* remained viable and virulent for guinea pigs after storage at —5° to —10° C. for nine years and three months to 10 years and eight months.

Dry, attenuated spores in sterile meal were both viable and virulent for guinea pigs after eight years' storage at 5° to 10° C.

Six different suspensions of attenuated spores in normal saline and glycerin, with or without addition of 2% saponin or 2% potassium alum, were viable and virulent for guinea pigs but showed a reduction of live spore content after storage at 5° to 10° C. from 11 to 14 years, while the spores in one such suspension, which were greatly reduced in number, were viable but nonpathogenic for guinea pigs after 13 years' storage.

Spores contained in dried blood on cotton swabs, collected directly from field cases, were viable and fully virulent for guinea pigs after one to nine years' storage at room temperature in a cabinet exposed to light.

References

1. Stein, C. D., and Rogers, Herbert. Observations on the resistance of anthrax spores to heat. *Vet. Med.*, 40:12, pp. 406-410. 1945.

2. Bongert, J. Beitrage zur Biologie des Milzbrandbacillus und sein Nachweis im Kadaver der grossen Haustiere. *Centralbl. f. Bakt. und Parasitenkunde* Erste Abteilung, 35:2. Originale, pp. 168-198. 1904.

3. Dawson, C. F. Anthrax with Special Reference to the Production of Immunity. U. S. Department of Agriculture, Bureau of Animal Industry Bulletin 137 (1911).

4. Momont, M. L. Action de la dessiccation de l'air et de la lumiere sur la bacteridie charbonneuse filamenteuse. *Ann. de L'institut Pasteur*, 6:1, pp. 21-31. 1892.

5. Emsbro, P., and Plum, N. Den Laboratoriemaessige Miltbrandsdiagnose. Maanedsskr. T. Dyrl., 45, pp. 113-137. 1933.

6. Cinca, A., and Fenea, G. Recherches sur le diagnostic post-mortem due charbon bacteridien, par l'examen bacteriologique des matieres fecales. *Compt. Rend. Hebd. des Seances de la Soc. de Biol.*, 67, pp. 301-302. 1909.

7. Klepzoff, C. Zur Frage uber den Einfluss niederer Temperaturen auf die Vegetativen Formen des Bacillus anthracis. *Centralblatt fur Bakteriologie und Parasitenkunde*, Erste Abteilung, 17:9 & 10, pp. 289-295. 1895.

8. Lehmann, Neumann, and Breed. Bacillus Anthracis, Text Book of Determinative Bacteriology (English Trans.) 7th German Edition, Vol. II, p. 591. 1931.

9. Poppe, Kurt. Uber den Einfluss niedriger Temperaturen auf Milzbrandbazillen. *Zeitsch. F. Fleisch u. Michhyg.*, Jg. 24, No. 21, pp. 485-489. 1914.

10. McCullough, E. C. Disinfection and Sterilization. Effect of Temperature upon Microbial Life, p. 121. Lea & Febiger, Philadelphia. 1936.

11. Quin, J. I. Studies on anthrax immunity. 15th Annual Report, Director of Veterinary Services, Department of Agriculture, Union of South Africa, Vol. 1, pp. 139-140. 1929.

12. Smith, Graham, and Further, G. S. Observations on the longevity of dry spores of *B. anthracis*. *J. Hyg. Camb.*, 41:5 & 6. 1941.

13. Umeno, S., and Nobata, R. On the viability of anthrax spores. *Soc. Vet. Sci, J.*, 17, pp. 221-223. (In Japanese. English abstract p. 87.) 1938.

14. Andrjevski, Petro. The influence of putrefactive gases on *B. anthracis*. *J. Bact.*, 16:3, pp. 151-155. 1928.

15. Stein, C. D. Studies and observations on the laboratory diagnosis of anthrax. *Vet. Med.*, 38:4, pp. 130-139. 1943.

16. Rahn, Otto. Physical methods of sterilization of microörganisms. *Bact. Rev.*, 9:1, pp. 21-23. 1945.

17. Hilliard, C. M., and Davis, M. A. The Germicidal Action of Freezing Temperatures on Bacteria. *J. Bact.*, 3, pp. 423-431. 1918.

18. Luyet, B. J., and Gehenio, P. M. Life and death at low temperatures. Monograph No. 1, Biodynamica, Normandy, Mo. (Cited by Rahn[16]). 1940.

The Effect of Hexachlorethane-Bentonite Suspension on the Lancet Flue, *Dicrocoelium Lanceolatum*

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SOTIRIOS SAKELLARIOU
Athens, Greece

OLSON[1] recently reviewed the use of hexachlorethane in distomiasis, particularly *Fasciola hepatica* infection. The literature referred to by Olsen is not available in Greece, and we are unable to say whether any studies have been made concerning the effect of hexachlorethane on the lancet fluke, *Dicrocoelium dendriticum (lanceolatum)*. The United States Bureau of Animal Industry has stated that they have no information which indicates that either carbon tetrachloride or hexachlorethane are useful against the lancet fluke.[2] We feel, therefore, that some observations we have made in Greece relative to these questions may be helpful.

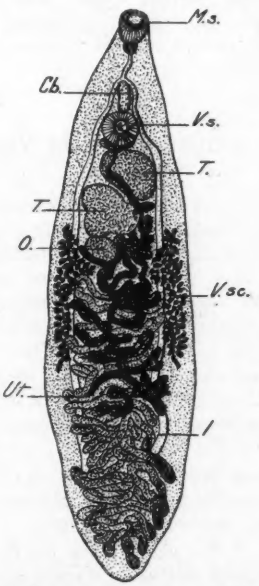
Liver fluke infections due to *F. hepatica* and *D. dendriticum* are a cause of severe economic losses each year in Greece. Carbon tetrachloride has been used in this country for many years in the treatment of distomiasis. A broad fund of experience has shown definitely that although carbon tetrachloride has a lethal action on the adult *F. hepatica*, it exerts little or no effect either on the immature form of that fluke or on *D. dendriticum*. The junior author (S.S.), for example, has treated hundreds of sheep having mixed infections of *F. hepatica and D. dendriticum*. One cubic centimeter of carbon tetrachloride given by capsule, or injected introrumenally was successful in killing the adult common liver fluke. The drug was ineffective, however, against young *F. hepatica*, as well as the lancet fluke. These findings were established at autopsy on animals dying two to four days after treatment.

Since a large quantity of hexachlorethane had been imported by UNRRA for the control of distomiasis, it was planned to determine the effect, if any, of this drug on the lancet fluke. The difficulties of executing detailed studies necessitated the performance of the following simple experiment:

A hexachlorethane-bentonite mixture was prepared by simulating Olsen's method.[1] Hexachlorethane crystals were ground to a fine powder with a mortar and pestle. Bentonite was added to form a final concentration by weight of 90% hexachlorethane and 10% bentonite. Of this mixture, 497gm were added to 710cc of water giving a final volume of about 900cc. A dose of 30cc of this suspension, which contained 15gm of hexachlorethane, was administered to each sheep.

Five sheep which showed advanced clinical signs of distomiasis were selected at the Athens abattoir in October, 1946. These animals were three to five years of age and weighed between 45 and 50 pounds. Food was withheld six hours before and 15 hours after administering the hexachlorethane-bentonite suspension. The animals were slaughtered 92 hours later, and an immediate examination was made of their livers.

A massive infection with *D. dendriticum* was found in the livers of four of the five treated sheep. Many young forms of *F. hepatica* were also present. The livers were not sclerotic. Hundreds of dead flukes were expressed from the bisected bile ducts of each



Dicrocoelium dendriticum. Ventral view. Enlarged. From Stephens, in Stephens, Fantham and Theobald, 1916 (The Animal Parasites of Man). *Cb.*, cirrus pouch, *I.*, intestine, *M.s.*, oral sucker; *O.*, ovary; *T.*, testis; *Ut.*, uterus; *V.s.*, acetabulum; *V.sc.*, Vitellaria.

*Chief, Livestock and Veterinary Section, UNRRA, Greece Mission.

of the infected livers. Search throughout the livers failed to reveal any living flukes, although it is quite possible that some may have been present in the hidden parenchymatous recesses.

The small scale of the experiment cautions against any sweeping interpretations. The striking results obtained, however, indicate the advisability of more comprehensive studies. It is hoped that the Greek veterinary services will undertake work along these lines in the near future.

Summary

Greek veterinarians, including one of the authors (S.S.), have frequently observed the inefficacy of carbon tetrachloride against lancet fluke infections of sheep, as well as the immature form of *Fasciola hepatica*.

Thirty cubic centimeters of hexachlorethane-bentonite water suspension, containing 15 grams of the active ingredient hexachlorethane, killed all of the observed lancet flukes and immature common liver flukes in four massively infected sheep.

Further studies on the use of hexachlorethane in *Dicrocoelium dendriticum* infection are indicated.

References

1. Olsen, O. Wilford. Hexachlorethane-bentonite suspension for the removal of the common liver fluke, *Fasciola Hepatica*, from sheep. *Am. J. Vet Res*, 7, pp. 358-364. 1946.

2. United States Bureau of Animal Industry, Washington, D. C. Personal communication, October 16, 1945.

Poultry Industry Needs Veterinary Service*

The poultry industry is big business in Iowa. The state's 200,000 flocks totaling more than 54,000,000 chickens with a valuation of $47,000,000 in 1945, made up 11% of the agricultural income of the state—greater than the combined total of dairy, sheep, lamb and wool income.

Too often the poultryman's problems are left to hatcherymen, a handyman in the neighborhood or some medicine vender with no training for the job.

We should fortify ourselves with scientific knowledge so that we can perform a real service for this important industry.

In view of the size of the poultry industry our veterinary colleges should give a more thorough training to veterinarians in the field of poultry diseases, sanitation, and poultry husbandry in general.

Many of the state colleges all over the country are beginning to recognize the importance of the poultry industry and are making special short courses available to practicing veterinarians. The possibilities of those schools are worth investigating.—*F. C. Tucker, Claypool, Indiana.*

*This discussion and the following one are adapted from a report of the 33rd annual meeting of the Eastern Iowa Veterinary Association, Oct. 15-16, 1946, which appeared in the *Cedar Rapids Gazette* of Oct. 16.

Defense Against Biological Warfare

The potentialities of bacteriological warfare are limited. The number of diseases which can be used offensively are not many.

In order to be militarily successful, a disease must have four qualities:

1. It must be easily spread.
2. It must be killing or powerfully destructive.
3. The victim nation must not have any vaccine for it.
4. The nation using it should have a vaccine.

The fourth point is the reason we were so interested in getting blood specimens from prisoners—to learn what they were immunized against.

No. 1 Possibility

Cattle plague was adjudged by U. S. authorities as the No. 1 possibility for enemy use since it had never been in North America, it spreads rapidly, is highly fatal, is not easily diagnosed and we had no vaccine, the speaker continued.

A successful spreading of this disease might have lost us the war. It certainly would have crippled our war effort and would have had a disastrous effect on our morale—even worse than the present meat shortage.

The St. Lawrence program was a success in that a vaccine was developed, through the use of eggs, which was 100% effective, cheap, safe, provided quick protection and was easy to prepare.

There were only three cattle plague vaccines known before and none was too practical, being either too expensive or too dangerous for effective use.

The most practical of the trio was made from bovine tissue but one calf could provide only a limited amount of vaccine.

It would have taken 50,000 calves and many years to prepare enough vaccine to immunize the cattle of the United States and Canada.

The St. Lawrence experiment resulted in a vaccine from a single egg supplying a sufficient quantity to immunize 100 to 120 cattle.—*R. E. Shope, Rockefeller Institute for Medical Research.*

Serum Level of Penicillin in Horses and Sheep following Infection in a Water-in-Oil Vehicle*

E. R. DOLL and F. E. HULL
Lexington, Kentucky

EMULSIONS of an aqueous solution of penicillin with oil and waxy substances have been proposed for delaying absorption and thereby prolonging the effective blood level following intramuscular injection.[3,4] Since such preparations are being sold to the veterinary profession, it appears desirable that information should be available on the duration of blood levels in animals following injection of water-in-oil emulsions containing penicillin.†

Material and Methods

Normal adult animals were used for all dosage trials. Injections were made intramuscularly in the gluteal region of the sheep and in the long head of the triceps of the horses. The material for injection was prepared by dissolving 100,000 units of penicillin sodium in 1cc of physiological saline and thoroughly emulsifying this solution in 4cc of U.S.P. peanut oil containing 2% U.S.P. white wax. The emulsion of penicillin solution in oil and wax contained 20,000 units per cc. Doses were measured accurately in units per pound of body weight and the entire dose was injected at one site. The amount of penicillin in the serum was determined by the method reported by Doll and Dimock.[1]

Results

In horses a dose of 500 units per pound maintained a measurable amount of penicillin in the serum for three hours, but not for four hours in two trials. At the three-hour period the quantities of penicillin in the serum were 0.02 and 0.015 unit per cc in two trials, in each of four trials. At the three-hour period the quantities of penicillin in the serum each. Absorption of penicillin occurred very rapidly, with the highest concentration in each trial present at 15 minutes following injection (Table I).

With sheep, a dose of 500 units per pound resulted in blood concentration which persisted in detectable quantity (0.015 unit per cc of serum) for four hours in two trials and for five hours in two trials. In each trial the highest blood level was present within 30 minutes following injection (Table II).

Discussion

By use of a water-in-oil emulsion, Cohn, *et al.*[4] obtained benefit in prolonging the period of measurable blood level and extending the time of urinary excretion of penicillin in human patients. With duplicate trials on each patient, Ory, *et al.*[5] found that serum concentrations obtained from injection of penicillin in a water-in-oil emulsion were not superior to those resulting from equal doses in the same volume of saline.

As reported by Doll and Dimock,[1] penicillin in saline solution containing 5000 units per cc produces measurable blood levels which persist for 2.5 to three hours when doses of 300 or 500 units per pound are used intramuscularly in horses. Absorption of penicillin in saline solution is rapid, the highest concentration being present in the serum within 15 minutes following intramuscular injection.

Using saline solution containing 5000 units of penicillin per cc, Doll and Hull[2] found that a dose of 500 units per pound maintained a detectable quantity of penicillin in the serum of sheep for four hours in each of seven trials.

TABLE I.—SERUM LEVELS OF PENICILLIN RESULTING FROM USE OF A WATER-IN-OIL AND WAX VEHICLE IN HORSES

Weight in pounds	Dose units per lb.	Total Dose units of penicillin	Units of penicillin per cc of serum at 0.25, 0.50, 1, 2, 3, 4 and 5 hours following injection						
			0.25	0.50	1.0	2.0	3.0	4.0	5.0
920	500	460,000	1.28	0.64	0.32	0.08	0.02	0.00	0.00
940	500	470,000	1.28	1.28	0.64	0.16	0.02	0.00	0.00
940	500	470,000	2.56	1.28	0.32	0.08	0.015	0.00	0.00
1140	500	570,000	2.56	1.28	0.32	0.08	0.015	0.00	0.00

*The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the directory.

†The penicillin used in this investigation was supplied for investigational use by Merck and Company, Inc., Rahway, N. J.

The maximum concentration was present in the serum at 15 minutes following injection.

In comparison with penicillin in saline solution, the emulsification of a concentrated solution of penicillin in saline with peanut oil containing 2% white wax caused no demonstrable delay in absorption following intramuscular injection in horses and sheep. The period during which penicillin may be detected in the blood of horses, following equal doses per pound of body weight, is not significantly prolonged by use of water-in-oil emulsion. In two trials with sheep the detectable blood level period was prolonged for one hour by use of the water-in-oil emulsion, while no benefit was obtained in two other trials.

TABLE II.—SERUM LEVELS OF PENICILLIN RESULTING FROM USE OF A WATER-IN-OIL AND WAX VEHICLE IN SHEEP

Weight in pounds	Dose units per lb.	Total Dose units of penicillin	Units of penicillin per cc of serum at 0.25, 0.50, 1, 2, 3, 4 and 5 hours following injection						
			0.5	1.0	2.0	3.0	4.0	5.0	6.0
146	500	73,000	0.64	0.32	0.08	0.04	0.02	0.015	0.00
150	500	75,000	0.64	0.32	0.08	0.04	0.02	0.015	0.00
154	500	77,000	0.64	0.32	0.08	0.02	0.015	0.00	0.00
120	500	60,000	0.64	0.32	0.08	0.02	0.015	0.00	0.00

Summary

The use of an emulsion prepared by combining 100,000 units of penicillin in 1cc of physiological saline with 4cc of peanut oil containing 2% white wax, produced no delay in absorption following intramuscular administration of equivalent doses in horses and sheep.

There was no significant prolongation of the detectable blood level period over that obtainable from straight saline solution of penicillin in equal dosage.

References

1. Doll, E. R., and Dimock, W. W.; Penicillin dosage and blood levels for horses. *J.A.V.M.A.*, 108, pp. 209-214. 1946.

2. Doll, E. R., and Hull, F. E.; Penicillin dosage and blood levels for sheep and calves. *No. Am. Vet.*, 27, pp. 623-624. 1946.

3. Freund, J., and Thompson, K. J.; A simple, rapid technic of preparing water-in-oil emulsions of penicillin, drugs and biologics. *Science*, 101, pp. 468-469. 1945.

4. Cohn, A., Kornblith, B. A., Grunstein, I., Thompson, K. J., and Freund, J.; Respository injection of penicillin in water-in-oil emulsion. I. Effect on gonorrhea. *Proc. Soc. Exp. Biol. & Med.*, 59, p. 145. 1945.

5. Ory, E. M., Wilcox, C., and Finland, M.; Serum levels after respository injections of penicillin. *Proc. Soc. Exp. Biol. & Med.*, 62, pp. 86-88. 1946.

Methods for Handling Mastitis

Bovine mastitis is controllable but the cooperation of the cattleman is necessary.

Too often the farmer is interested solely in treatment for the diseased animal and is not willing to go to the extra trouble and expense of carrying out effective control measures.

If your client will not cooperate with you, you will be disappointed in the results.

Nine measures should be followed in combating mastitis in a dairy herd.

1. Make a diagnosis, both physical and laboratory if necessary, in order to determine definitely which animals are diseased.

2. Cows then should be arranged so that the clean cows are milked first. This is one of the most important parts of control. It may be inconvenient but this routine should be followed at every milking.

3. Elimination of injury. It has been found difficult to infect a healthy cow but injured teats and udder can easily become infected.

4. Proper milking operation. Milking machines have received somewhat of a "black eye" in this connection but they are satisfactory if operated correctly. However, latent cases of bovine mastitis have been known to develop into acute cases when operation of the machine has been speeded up too much or when the vacuum was set too high.

5. Correct washing procedure—get away from the "single rag" practice for it may become infected and the disease be transmitted.

6. Keep milk off the floor because the milk may contain infection.

7. Prevent heifer calves from sucking one another because it is apt to cause serious injury to the udder.

8. Care of dry cows. The practice of letting dry cows "rough it" increases the possibilities of injury. Ofttimes a cow which was not infected previously is found to be infected during the first periods of lactation. Better care during the dry period, thereby cutting down the possibility of injury, would lessen infection at that time.

9. Avoid "buying the infection" when purchasing or trading cattle.—*R. R. Packer*, Dept. of Hygiene, Iowa State College.

*This discussion is adapted from a report of the 33rd annual meeting of the Eastern Iowa Veterinary Association, which appeared in the *Cedar Rapids Gazette* of Oct. 16, 1946.

Osteogenic Sarcoma in a Dog

By W. T. LIGHTLE
Globe, Arizona

MARCH 2, 1945, a black male Labrador Retriever, two and one-half years of age, and weighing approximately 50 pounds, was presented for treatment with a history of having been dull and listless for three days and having become lame in the right hind leg the preceding day.

The dog's temperature was 104° F. and the lameness seemed to be localized in the right coxo-femoral articulation. Physical examination disclosed an enlarged prostate gland, and a diagnosis of prostatitis with accompanying arthritis was made. The dog was treated with stilbestrol and sulfathiazole as indicated in the table of treatments. Both the abnormal temperature and the lameness disappeared on the second day of treatment.

Six weeks later the dog was returned with a

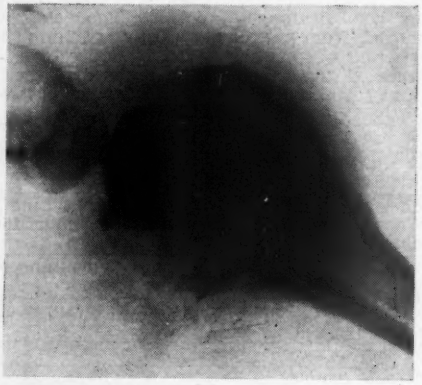


Plate 1a. Radiograph print of stifle joint taken from lateral to medial. Note the sunray effect of the osteogenic tissue

history of having been lame in the same leg during the previous week. The temperature was 102.8° F. and a fecal examination for parasite eggs was negative. Diagnosis and treatment were the same as before.* Again two weeks later the dog was returned with the same symptoms. Diagnosis and treatment were the same as on the previous occasions.

May 10, 1945, the dog returned lame in the same leg and was carrying it so that the foot did not touch the floor. Palpation of the prostate gland indicated that it had returned to nearly normal size. Examination of the leg revealed a swelling on the medial side of the stifle joint, and fluoroscopic examination of the swelling revealed nothing abnormal. A test puncture of the swelling with a hypodermic needle allowed the removal of a small amount of clear fluid. Diagnosis of "hematoma" was made with surgical treatment following. By this time the muscles of the leg were beginning to atrophy from disuse due to the arthritis. Following treatment, the swelling disappeared within a week and complete

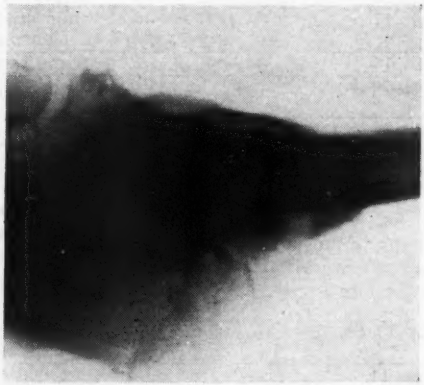


Plate 1b. Radiograph print of stifle joint taken from posterior to anterior

recovery apparently took place. The dog used all four legs normally in walking, but carried the injured leg when running.

June 11, 1945, the dog was presented with a large firm swelling at the stifle joint. It was unable to use the limb. Radiographs of the joint taken from lateral to medial and from posterior to anterior showed the presence of osteogenic tissue. See plates 1a and 1b. Five days later the leg was amputated at the mid-

Plate 2a. The subject, too weak to stand, is being partially supported by the tail. Taken the day before death, the picture shows the healed stump of the right hind leg and one of the neoplasms in the skin near the top of the shoulder

*This phase of the case was reported in *Vet. Med.*, Nov., 1945, p. 387, "Stilbestrol and Sulfathiazole in the Treatment of Acute Prostatitis in the Dog."

TABLE NO. 1—TREATMENT

Date	Temp.° F.	Pulse	Treatment Administered
March 2	104.0	—	6mg stilbestrol intramuscularly; two 30-grain doses sulfathiazole *per os* 5 hours apart.
March 3	101.2	—	4mg stilbestrol intramuscularly; 30 grains of sulfathiazole followed by 15 grains in 5 hours.
March 4	—	—	Two 15-grain doses sulfathiazole 10 hours apart. Dispensed 15, 7.7-grain tablets of sulfathiazole to be given t.i.d. by the owner.
April 14	102.8	—	6mg stilbestrol intramuscularly; 21 grains sulfathiazole *per os* followed by 7.7 grains 8 hours later.
April 15	—	—	4mg stilbestrol intramuscularly; four 7.7-grain doses sulfathiazole *per os*.
April 16	—	—	Three 7.7-grain doses sulfathiazole *per os*.
April 17	—	—	4mg stilbestrol intramuscularly; two 7.7-grain doses sulfathiazole *per os*.
April 18	—	—	Same treatment as on April 17.
April 19	—	—	Two 7.7-grain doses sulfathiazole *per os*. Dispensed sulfathiazole to continue this treatment for three more days.
April 28	102.0	—	6mg stilbestrol intramuscularly. Dispensed 14 sulfathiazole 7.7-grain tablets and 10 sodium salicylate 5 grain tablets.
May 10	—	—	The surface of the swelling was shaved and disinfected. A test puncture with a hypodermic needle allowed the removal of a small amount of clear fluid. An incision was made into the swelling to allow good drainage, and some blood clots and fibrin were removed from the cavity of the swelling. The cavity and the wound were swabbed with tincture of iodine and the leg bandaged. Tincture of iodine was dispensed to the owner for daily application during the following week.
May 17	—	—	The wound was swabbed with tincture of iodine and then rebandaged.
June 11	—	—	Lateral to medial and posterior to anterior radiographs made of the right stifle joint.
June 16	103.8	—	With the dog under nembutal anesthesia, the right hind leg was amputated aseptically at the middle of the femur. 150cc 5% dextrose solution given intravenously.
June 17	—	—	10cc canine distemper antiserum (bio. 660) subcutaneously and 23 grains sulfathiazole *per os*.
June 18	102.2	—	Wound dressed with a sulfanilamide pack. 23 grains sulfathiazole *per os*.
June 19	103.0	—	Two 15-grain doses sulfathiazole *per os*.
June 20	—	—	15 grains sulfathiazole *per os*.
June 21-25	—	—	Dog exercised and wound dressed.
Sept. 18	103.8	—	10cc anti-canine distemper serum (bio. 660) subcutaneously; 30 grains sulfanilamide *per os*.
Sept. 19	—	—	30 grains sulfanilamide *per os*.
Sept. 20	104.0	—	30 grains sulfanilamide; 15,000 units penicillin intramuscularly.
Sept. 21	105.4	—	30 grains sulfathiazole; 10 grains methenamine; two 10,000 unit doses penicillin intramuscularly.
Sept. 22-25	103.0	—	Same treatment as on Sept. 21.
Sept. 27	103.4	—	15,000 units penicillin intramuscularly; 15 grains sulfanilamide; 10 grains methenamine.
Sept. 28	102.4	—	10,000 units penicillin; 15 grains sulfanilamide; 10 grains methenamine.
Sept. 29	103.6	—	15,000 units penicillin; 15 grains sulfanilamide; 10 grains methenamine.
Oct. 8	104.0	150	No treatment. Advised euthanasia.
Oct. 9	—	—	With dog under nembutal anesthesia, 5cc chloroform injected into the spinal cord at the occipito-atlantal articulation. Post-mortem examination followed immediately.

dle of the femur and the dog treated for surgical wounds. Laboratory examination of representative material taken from the swelling confirmed the diagnosis.

During the following month the dog made a nice recovery, gained weight, and appeared to be in excellent health. He seemed to get around on three legs almost as easily as on four. September 18, 1945, the dog was presented with the history of having been droopy

for the last few days, having a rough hair coat, losing weight, and experiencing difficult respiration. The temperature was 103.8° F. The condition was diagnosed as bronchitis, and the dog was hospitalized for treatment with sulfanilamide, sulfathiazole, and penicillin. Treatment seemed to have little effect on either the temperature or the condition. The dog was

Plate 2b. Taken at the same time as was 2a, this picture shows some of the neoplasms in the skin where the hair has been clipped away. The neoplasm at the top left has broken open leaving an ulcer

finally sent home with the hope that eventual recovery would take place.

October 8, 1945, the dog was returned with the urgent request that something be done for the animal. It had become emaciated and weak with neoplasms forming in the skin, one of which had broken open forming an ulcer. See

Plate 3. With the thoracic and abdominal wall removed, the great involvement of the lungs can be seen. The stump of the right leg can be seen at the left. Two areas of involvement can also be seen on the surface of the kidney

Plates 2a and 2b. The extremities were swollen and the animal was so weak it could hardly move. The temperature was 104° F. and the pulse rate was 150 per minute. A diagnosis of metastasis of the osteogenic sarcoma was made and euthanasia advised. This was agreed upon and the animal disposed of by introducing 5cc of chloroform into the spinal cord at the occipito-atlantal articulation with the animal under nembutal anesthesia.

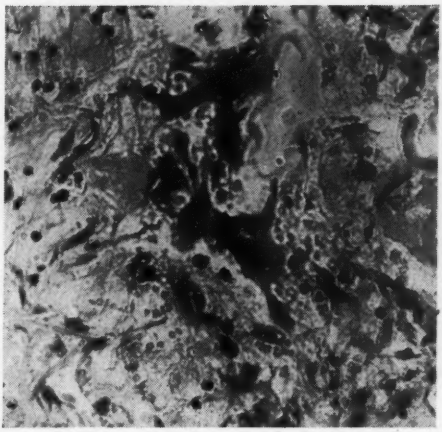


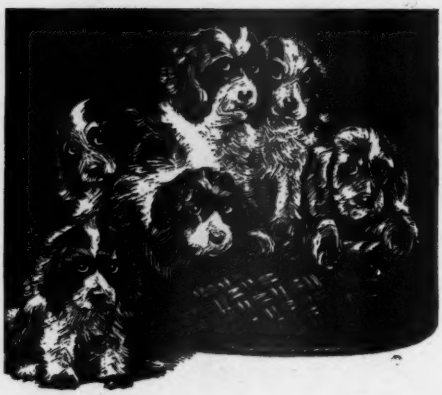
Plate 4. A photomicrograph of a representative section from involvement in the lungs. Two large spicules of bone may be seen in the center of the picture. Numerous mitoses indicated this to be a highly pathological process

A post-mortem examination was performed immediately. There were 24 neoplasms in the skin scattered over the body and ranging in size from one-quarter to one inch in diameter, several large ones being located along the thoracic vertebrae. A sharply circumscribed bony swelling about one-half inch in diameter was noted at the gum-line of the second premolar of the mandible.

The thoracic and abdominal walls on the right side were removed without disturbing the lungs and viscera. See Plate 3. Thin pus was seen coming from between the parietal pleura and the thoracic wall. The lungs appeared to be almost completely involved with neoplastic tissue, but the liver showed no involvement. The kidneys showed some involvement of both the medulla and cortex. On the parietal pleura of the left side near the articular end of the last rib, were two neoplasms, one about one inch in diameter and the other about three-eighth inch in diameter. A slight cystitis was present. The pancreas appeared normal, but the walls of the intestine were somewhat thickened throughout its length. A few tapeworms were present.

The proximal part of the right femur, the stump, was slit longitudinally, but there was no gross evidence of a neoplasm. Normal healing following the amputation had apparently taken place with a bony plate having formed across the open medullary cavity of the femur.

Laboratory examination of the neoplastic tissue from the skin, lungs, and kidney showed all to be osteogenic in nature. A photomicrograph of a section from the lung shows spicules of bone being formed in this location. See Plate 4.



Ovarian Transplantation in Dogs

By LEON F. WHITNEY
New Haven, Connecticut

IN a recent paper in *Science*,[1,2] I described the successful transplantation of ovaries from two aged bloodhounds into two young foxhounds and mentioned some of the interesting effects resulting from the transfers. Neither bitch conceived after the transplantation. This paper concerns not only a new method of operation but reports the fertile result of a transplant.

The method described, in the publication referred to, resulted in satisfactory union of ovary to fundus, but examination of ovaries from one of the bitches which was sacrificed, approximately 10 months after the transplantation, disclosed that extensive adhesions had developed between the capsule and the surface of one ovary. The other ovary appeared quite normal, but the fact that she did not conceive, when mated, was a fair indication that possibly some mechanical obstacle prevented union of sperms and ova. The other bitch remains sterile to the present time, notwithstanding she has been mated five times to fertile dogs. There is always the hope that continued ovulations may free the capsule from the surface of the ovary, and conception occur. But even if this bitch should never conceive, she is extremely useful in studying the effect of the recipient on the ovaries of another animal and the effect of the donor's ovaries on the recipient. The ovaries of the latter served her, the former trustee (bloodhound), well throughout her life, and instead of playing out as was to have been expected, they continue, in their new host, to do their part in helping to produce the customary estrous cycles. It will be most interesting to observe for how long they can continue to so function, in the body of the present trustee.

The technic employed, in the first two successful transplants, involved operating when the recipient bitches were in early estrus. At this time there is an abundant blood supply in the ovaries. The technic used was as follows: laporotomy, withdrawing of first one ovary through a three-quarter-inch incision, incising the capsule, taking care not to injure the fallopian tube where it twists its way over the capsule, slicing the ovary from its fundus, suturing the new ovary in its place with interrupted fine gut sutures around the periphery, suturing the capsule together and replacing the ovary in the abdomen, repeating the operation on the other ovary, and the usual closing of the abdomen.

The effect was a slight decrease in the intensity of the mating manifestations, and then, in a few days, an increase in the intensity, so that the whole cycle was not only unimpaired, but went on through the usual acceptance period. However, as stated, when the bitches with the transplanted ovaries were mated, neither conceived. Then, instead of coming into estrus again six months later, they came in at about the time that it would have been due in the bloodhound donors.

The bitch that we kept has not been quite regular following the operation, but has been in heat four times since receiving the transplanted ovaries, *i.e.*, instead of a regular, six-month periodicity, she has been coming in heat at about four-month periods as follows:

May 25, 1945	Transplant operation
Aug. 29, 1945	In heat (approx. bloodhound's period)
Jan. 7, 1946	In heat
May 22, 1946	In heat
Sept. 9, 1946	In heat

Each of these periods of estrus has been completely normal.

Naturally the failure of these bitches to conceive posed a problem which it was desired to solve. Even though the transplants had been accomplished and had shown some most interesting facts; having a bitch, with transplanted ovaries, produce puppies would reveal additional data. Help was sought, and a friend* suggested that the use of very fine silk sutures might obviate the adhesions between the ovary and the capsule. Possibly this was the reason for the success described in this re-

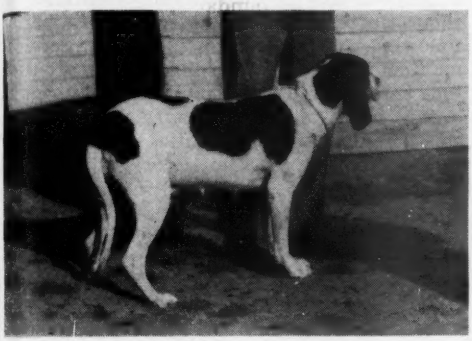
[1] Whitney, Leon F. The successful transfer of ovaries between dogs of different breed. *Sci.* 103:2682, pp. 654-655. (May 24) 1946.

[2] Ibid. Transplantation of ovaries in a bitch (Abst.). *Vet. Med.* 41:11, p. 414. 1946.

*Dr. John S. Lockwood, Professor of Experimental Surgery, Yale Medical School.

port, or possibly it may have been due to another alteration in the technic, or to a combination of the two.

In performing many thousands of spaying operations, I have noted that, in not a few fertile bitches, the slit at which the fimbria tubae are located, has become enlarged and the capsule has slipped back exposing the entire ovary. So my next operation was simply to enlarge the slit and slip the capsule back



A foxhound bitch into which ovaries from an aged bloodhound were transplanted. She has been in estrus four times since the transplant

off the ovary, thus obviating the necessity of closing the capsule over the ovary and eliminating one opportunity for adhesions.

An excellent Dalmatian bitch was used for a third transplantation. She had been bleeding about four days. At the time I had on hand an old cocker spaniel bitch which had been bred many times, but the last three times had resorbed her fetuses as bitches do in old age. It happened that she was in heat just when the Dalmatian was, but her estrus had existed for 13 days. Her ovaries were used for transplantation. Both bitches were anesthetized; the cocker was spayed by the usual spaying operation. Both her ovaries were covered with large unruptured follicles which had to be ruptured in order to suture the ovaries in place in the Dalmatian.

The Dalmatian's abdomen was opened as in the spaying operation, an ovary extracted, the slit at the fimbriae lengthened, anteriorly,† the ovary sliced off its fundus and the cocker spaniel ovary sutured in its place with eight 000000 silk sutures. The cocker ovary was smaller than the Dalmatian's fundus and was approximated with difficulty. The capsule was then slid over the ovary, one suture inserted to shorten it to a size normal for the cocker ovary and the organ was replaced in the abdomen. The other Dalmatian ovary was withdrawn and handled as was the first. Then the abdomen was closed and developments awaited.

These developments were somewhat unlike the phenomena which followed the first transplantations. Instead of continuing in heat, estrus ceased in this bitch within a few days following the operation. It was guessed that the rupturing of the cocker's follicles had caused the development of corpora lutea, which caused the cessation of the Dalmatian's heat. At any rate, she had no interest in mating, but dogs with which she was placed showed the greatest interest in her for at least a week following the operation. She refused to copulate and her vulva shrank almost to its normal size.

This Dalmatian transplant operation was July 16, 1946. Seven weeks later—September 1, 1946—she started coming in heat again. September 15, 1946, she was mated to a black and white English setter. The dog had white points but was mostly black. An attempt was made to mate her with a cocker but the only stud available was much too small, and rather than risk artificial insemination, a setter was used because, except for size, setters and cockers have similar genetic characteristics.

This Dalmatian bitch is trustee of the ovaries of an aged cocker spaniel. She was three weeks pregnant when this picture was made and has recently whelped two puppies

The cocker was black, and carried red and spotting recessively. The setter could be expected to produce puppies generally with more white than he showed. He also carried the tricolor factor.

October 12, 1946, palpation of the Dalma-

†If the enlargement is made toward the uterus there is more hemorrhage than when made toward the kidney.

tian's abdomen according to the method previously described[3] revealed that she was definitely pregnant. When one lump was felt, no further attempt was made to locate others. There could be no mistake. This lump was equivalent to 27-day pregnancy, and that coincided with the date of the mating.

November 15th the Dalmatian whelped two female, black and white puppies. Unfortunately, one had a cleft palate and died but the other, as this is written, is well and growing nicely.

This is the first successful, fertile transplant in dogs. By using the method outlined, any surgeon, interested in performing the operation, can do so with ease.

This is not the place to attempt to outline all implications growing out of the operation, but they are many. From the practical viewpoint of the veterinarian, however, it will serve as a means of preserving the heredity of valuable bitches owned by clients. We don't know how long ovaries can continue to produce ova,** but we have at least a hint that it is not the ovaries that cause the aging of their custodian, but rather the custodian that causes the ovaries to age. This is contrary to the opinions held by most geneticists. Maybe in this way the germplasm can go on from one generation to another, not having to depend upon union with that of the opposite sex (hence mixture) for survival. The possibilities in establishing pure breeds, *e.g.*, invite speculation.

Perhaps the author may be pardoned for injecting a note of biology here: it becomes more and more apparent from such experiments as this that the individual certainly does not create the germplasm, but is created by it and acts only as its custodian or trustee.

* * * *

Before the war, the Japanese health authorities organized a "rabies prophylaxis week" each year, during which dog owners were urged to have their pets vaccinated. From 1918 to 1930 approximately two million dogs in Japan were vaccinated against rabies. Approximately 0.017% (350) of the vaccinated dogs succumbed to the disease. During the same period there were 16,522 cases of rabies among unvaccinated dogs in Japan.

[3] Ibid. The diagnosis of pregnancy in the bitch by palpation. *Vet. Med.* 31:5, pp. 216-221. 1936.

**A. Schotherer (*Anat. Anzeiger*, 65:117. 1928) shows that at birth ovaries contain about 200,000 follicles, at puberty, 355,280, at five years 33,840, at ten years 518. Histological examination of the ovaries removed from the sacrificed foxhound bitch, mentioned early in this article, shows clearly that there has been effective rejuvenation. Large numbers of active follicles may be seen in prepared slides from the ovaries notwithstanding they were originally from an aged bitch.

Rabies Elimination*

Rabies, a disease which was recognized as early as 300 B.C., could be eliminated from the United States within five years.

It is quite evident that with vaccination and quarantine, within five years Iowa and every other state could be free of rabies. Then by federal quarantine, we could keep rabies out of this country.

Control in England

England has prevented the occurrence of rabies since 1903 with the exception of a period following World War I when returning servicemen smuggled dogs into the country. It then took three years to eradicate the disease again.

A program of universal vaccination with a state rabies officer and deputies in every county to see that the program is carried out would bring the disease under control promptly in this state. It would then be necessary to quarantine all dogs coming into the state for sufficient period to determine whether they were diseased. Nationwide eradication would eliminate the necessity for state quarantine.

England's quarantine period is six months and neither sentiment nor political pressure can bring relaxation of the regulation.

Rabies rarely appears in communities where there is vaccination and interstate control on shipment of animals. If we can stop it in dogs, the other animals will take care of themselves for it is rarely spread except by dog bites.

Further proof of the importance of a quarantine program is provided in statistics which show that the greatest number of rabies cases in Iowa are in the southeastern section of the state where Iowa touches highly-infected sections of Illinois and Missouri.

Adults are not as susceptible to the disease as children and the same susceptibility according to age is true among animals.

The region of the bite is an important factor with wounds about the head and neck being more serious than around the foot and lower portions of the body.

Extent of the wound also is a factor; large and deep puncture wounds being highly dangerous. The amount of clothing also bears on how serious the infection may be in that the clothing will absorb some of the saliva.

Records kept at the Hygienic Laboratory of the Iowa Department of Health show that there are high and low points in the number of cases throughout the year. The disease is no respecter of seasons, but occurs whenever there are sufficient dogs to disseminate it.—*L. H. Borts, Iowa Department of Health.*

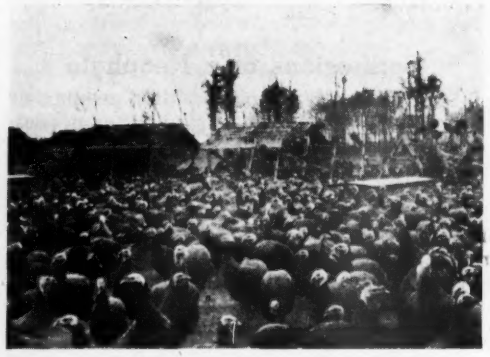
*This discussion is adapted from a report of the 33rd annual meeting of the Eastern Iowa Veterinary Association, Oct. 15-16, 1946, which appeared in the *Cedar Rapids Gazette* of Oct 16.

Clinical Reports

Infectious Sinusitis of Turkeys

In an attempt to determine the cause of the disease of turkeys known as "infectious sinusitis," the following limited experiment was run in 1945.

In an outbreak of sinusitis in a flock of several thousand turkeys exudate was withdrawn from 71 of the swollen, infected sinuses, in sterile glass syringes, after painting the area with a 5% phenol solution followed by a 70% alcohol solution. It was observed that a considerable percentage of the sinuses contained a caseated material, while others contained a viscid fluidlike exudate.



Sinusitis in a flock of thousands of turkeys is serious

The exudate was immediately protected from the sun's rays and taken to the laboratory under sterile conditions. In the laboratory, transfers of the exudate were made to blood agar and eosin methylene blue agar plates. It was incubated for 48 hours at 37° C. Upon examination of the 71 samples the following results were recorded:

1. Growth on blood agar 21%
   (a) Small, gram-negative, pleomorphic rod 86%
   (b) Staphylococcus 14%
2. Growth on eosin-methylene blue agar 3%
3. Negative growth on EMB and blood agar 76%

To study the disease further, a pen of turkeys which had been reared under confined conditions and had not contacted the disease in any known manner was selected for experimental purposes. Four birds were inoculated on the dates shown; 1cc of exudate suspension being injected into the left sinus of each bird. The following table illustrates the procedure of the experiment:

TABLE I

Turkey No.	Date Inoculated	Remarks
174	July 2	Site swabbed with 5% phenol followed by 70% alcohol. July 7: first swelling of sinus visible. July 14: sinus greatly enlarged. Exudate contained small gram-negative pleomorphic rods.
58	July 14	Exudate taken from turkey No. 174. July 21: symptoms of swelling. July 24: small, gram-negative, pleomorphic rod isolated from exudate.
25	July 14	Exudate taken from turkey No. 174. July 24: Symptoms of swelling. July 24: sinus aspirated and plated on blood agar and EMB. July 26: negative growth on both media.
375	July 17	A sterile saline suspension of the small, gram-negative, pleomorphic rod taken from a blood agar plate previously inoculated with the exudate of turkey No. 175 was injected. July 24: no visible symptoms. July 24: period of hot dry weather. Aug. 8: several days of damp cool weather encountered. Aug. 8: symptoms of swelling. Aug. 16: left sinus aspirated and blood agar and EMB plates inoculated. Aug. 18: small, gram-negative pleomorphic rod isolated.

Conclusions

1. The disease was easily transmitted by artificial inoculation.

2. Both exudates containing the small, gram-negative, pleomorphic rod and exudates not containing any known bacterial growth were characteristic symptoms of sinusitis in inoculated turkeys.

3. As seen in the case of turkey No. 375, it would seem that the conditions of cool damp weather predispose the turkeys to an outbreak.

In a further effort to find the cause of the disease other than by transfer of the small, gram-negative, pleomorphic rod, a controlled experiment was run. As before 1cc of exudate was injected into the left sinus of each bird. The record is shown in Table II.

TABLE II

Turkey No.	Date Inoculated	Remarks
*311	Aug. 17	Exudate negative for bacterial growth on blood agar and EMB agar. Aug. 21: symptoms slightly visible. Aug. 25: left sinus greatly swollen and congested. Aug. 25: sinus aspirated and exudate transferred to blood agar and EMB agar plates. Aug. 27: gram-negative, pleomorphic rod isolated from blood agar.
*395	Aug. 17	Exudate negative for bacterial growth on blood agar and EMB agar. Aug. 26: symptoms of swelling and congestion clearly visible. Aug. 26: sinus aspirated and plated on blood agar and EMB. Aug. 28: gram-negative, pleomorphic rod isolated from blood agar.
**334	Aug. 17	Exudate positive for growth of gram-negative, pleomorphic rod used. Aug. 21: no symptoms. Aug. 26: no symptoms. Sept. 9: no symptoms.

Conclusions

1. It would appear from the above experiment that an infectious agent (virus) other than a bacterium was involved in the transmission of the disease. This substantiates the theory of Hart.[1]

2. The predisposing effect of coolness and dampness was further substantiated.

Summary

1. The predisposing conditions of cool damp weather appear to have a very important effect in relation to the virulence in an outbreak of sinusitis in turkeys.

2. The role of the gram negative, pleomorphic rod is not clear, but it may be a secondary invader.

3. The average incubation period appears to range between five and 10 days following the predisposing exposure.

4. In all cases of artificial inoculation, the disease remained unilateral.

5. An attempt was made to grow the suspected virus on incubated chick embryos, but no definite conclusions could be based upon the limited amount of inoculations which were made.

*Turkeys No. 311 and No. 395 were placed in individual pens which were covered with dampened burlap so as to keep out all sunlight and create a damp, cool atmosphere within the cages.

**Turkey No. 334 was placed in an individual cage, where sunlight was available and conditions in the cage were warm and dry.

Acknowledgment

The author wishes to thank Dr. L. D. Bushnell for his advice and help in preparing and conducting the foregoing experiments.

The experiments as run were in cooperation with additional work on sinusitis, mainly from the pathological standpoint, run by Dr. Gerold O. Sigars.

References

1. Hart, L. Sinusitis in turkeys. *Austral. Vet. Jour.*, 16:163. 1940.

J. L. NOORDSY

Ames, Ia.

Confessions of α Neophyte

Sometimes one gets a bit tired reading of accurate diagnoses and miraculous recoveries. Why don't we see more of the mistakes in diagnosis and treatment which surely occur somewhere each day. Most veterinary practitioners learn from their mistakes as much as by their successes. I doubt the word of any who claim to end each month of the year with a perfect record—without some backward thought to a case where a different diagnosis or a different therapy might have been more successful.

In my comparatively short experience in practice there have been a few bad moments.

This article is intended for the recent graduate, faced with those first few painful months of practice which are made the more difficult by that omnipresent well-known teacher, experience.

My first call was to a drove of pigs which were not nearly as sick as the owner thought them to be. I looked over the herd and desperately wondered what a healthy pig would look like if these were sick. A hurried consultation with my experienced partner, a second trip, and a mineral salt both extricated me and satisfied the client, and was probably beneficial to the swine. In fact, indirectly, the mineral was definitely beneficial since had I not prescribed something, the owner would have "wormed" the pigs.

That first entire month passed with me leaning heavily upon my partner before I could even form a basis from which I could begin to use a little common sense and figure problems out for myself. I made a diagnosis of hog cholera three times. I now believe that two of the herds really had swine erysipelas, because cholera antiserum and virus pulled too many of the sick pigs through in too great a hurry.

My first five bovine obstetrical cases seemed to be all against me. One calf remained *in situ;* one heifer was down 30 days with obturator paralysis before getting on her feet; another

cow had prolapse of the uterus following delivery; and one case caused me to miss my Christmas dinner before the fetus was removed in three parts *via* embryotomy. On the fifth obstetric case, an emphysematous fetus, I toiled miserably for five hours on only to have the cow die. This set me to studying USDA statistics to locate a territory in which there were no calves born. It required two months of simple malpositions before I was able to keep a steady hand at the wheel to an O. B. case.

When I was graduated I considered myself well qualified for any type of equine call but only a short period elapsed before my attitude was changed. A white gelding with "glass eyes" went off his feed and, according to the owner, showed colicky symptoms. Examination showed a listless animal, temperature 103.2° F., injected mucous membrane, jerky expirations and a pronounced grass-green cast of the normally white iris. The gelding was given 24mg atropine; 50gm sulfanilamide; and strychnine and dextrose intravenously in physiological saline solution. The greenish color began to fade from the iris the following day and after 10 days of spiritless eating and walking, the horse seemed quite normal. What diagnosis should have been made and why the animal improved would still interest me.

A call to see a sick mule came in about midnight. He was standing off from the others in the yard and hadn't eaten for 36 hours. When aroused, he moved with a stumbling gait and would turn only to the right. He was very wobbly and weak, would chew an ear of corn a minute before dropping it, would drink water when held up to him but slobbered extensively. After finding a normal temperature, I made a tentative diagnosis of encephalomyelitis. My partner examined the animal the next morning and made a simple diagnosis of an injured cervical vertebra. This prevented the mule from grazing and accounted for the weakened condition.

With my partner present for moral support, I attempted the castration of a cryptorchid but gave up after 90 minutes of futile search for the hidden gonad. My partner then produced a gelding in short order but eventually the animal died when the intestines worked through the opening.

One day I was floating the teeth of an expensive gelding, when suddenly the float quit rasping. Examination revealed the loss of the rasp blade. My consternation was great when I couldn't find the rasp. Soon, however, I retrieved it from between the upper molars and the cheek. This same client called me "to open a mare." Evidently I had been asleep during some class because I couldn't recall such a job. Hoping that the client didn't know too much about it either, I worked a finger through the cervix, cleaned the vagina with cotton, washed it out with a gallon of soda water, again swabbed with cotton, and left wondering if the mare had been helped. There was no question it had helped the owner tremendously.

On cow completely stumped me with pleurisy. After ruling out traumatic gastritis and pericarditis, pneumonia, impaction, acetonemia and everything else resembling the condition, I went ahead with treatment for acetonemia. Again my partner came through with the correct diagnosis and the cow quickly improved under the correct therapy.

Another client desired an operation for a ventral hernia on a week-old calf. After obtaining a surprisingly good anesthesia with 7% chloral hydrate solution, I proceeded with non-sterile surgery. It didn't take long to demonstrate the folly of a hasty examination for, instead of a slight hernia, I found the whole ventral belly wall parted from the pelvis to the sternum. It was a fine mess with the muscle apeneuroses and peritoneum nicked through in several places, the umbilical cord tied off, the mammary tissue separated, and the poor calf under anesthesia two full hours and the poor veterinarian working his head off for an equal period. It was impossible to overlap the adbominal muscle walls, the tension on the sutures being terrific to merely bring them into opposition, so I removed a six inch strip of skin, with still plenty of spare, and quickly finished the job, then sat down to rest and watch the calf die. It is marvellous what a few sulfa tablets can do. Three months later that calf was vealed.

As pointed out, I leaned heavily upon my partner and heaven only knows what this report would look like without such a bulwark of experience. What I should have confronted had I faced alone the past year in practice, only God knows. My short experience has taught me one thing above all else—to have patience. It shouldn't be necessary to point out that nervousness doesn't aid in making a diagnosis in occult conditions, but I imagine even the old timers will recall short periods of excitement when complexities reared before them. How about making us youngsters feel a bit more hopeful by telling us of some of those bad cases rather than those which end with every one concerned in a happy state of mind? Who knows, we may profit by your mistakes as much as we are inspired by your paeans of success.

A. Nony Mous.

Anaphylaxis in a Dog

An eight-month-old, male, Kerry Blue terrier was presented to me at three o'clock in the morning. He displayed marked muscular rigidity and trembling, was unable to stand and the breathing was labored with marked inspiratory sounds.

The anamnesis revealed that the dog had been undergoing a series of anti-distemper inoculations of the serum, serum, virus type. The animal had its first serum inoculation one week previously and the second the preceding day.

The dog showed its first symptoms of unrest about 11:00 .p.m. and, after waiting a few hours trying to get in touch with their own veterinarian, the owners brought the dog to our clinic, the Speyer Hospital in New York City.

In the light of such a history strychnine or food poisoning was ruled out. The dog was given 2cc epinephrine hydrochloride subcutaneously followed by 3cc pentobarbital sodium intraperitoneally, and was kept under sedation until four in the afternoon, when it was released and sent home.

Anaphylaxis is a name given by Richet to a certain phenomenon of hypersensitiveness in experimental animals. The word means "without protection" and was applied because Richet, at the time, regarded the condition as a state of defenselessness. However, anaphylaxis is now regarded as a state of excessive reaction, so violent that the consequences may be harmful to a part or all of the organism, and often fatal to it.

Urbach states "Anaphylaxis should be considered as a special case of allergic hypersensitiveness—a state brought about under certain conditions, usually as a result of parenteral injection of a protein antigen—in animals and human beings."

Anaphylaxis is a common phenomenon in experimental animals. It can be induced readily in all of them, but most easily in the guinea pig. It occurs in domestic animals usually as an accident incidental to therapy. It would seem the frequent occurrence of anaphylactic shock in pigs as a result of vaccination for the prevention of hog cholera and in calves following injection of hemorrhagic septicemia bacterin, which was reported in the veterinary literature of the 1920's and 30's, was shock but not anaphylactic shock. Quoting Urbach again:

"The following three conditions must be fulfilled to achieve active anaphylaxis: (1) the preparatory or anaphylactizing contact; (2) an appropriate period of latency, called, by analogy, the "incubation period"; during which the organism produces anti bodies; and (3) the subsequent eliciting contact."

The pathological condition which brings about anaphylaxis in animals varies with the species. In the rabbit, it is due to a smooth muscle spasm in the pulmonary vessels; in the cat, to a spasm of the smooth muscle in intestines and renal arteries; in the dog and rat to spasm of the smooth muscle fibers in the hepatic veins. These varying pathologic conditions are responsible for the differing symptoms in the different species. However, according to Urbach, etiologically the involvement is the same in all species—due to antigen-antibody reaction in the non-striated muscle in the mucous membranes or in the capillary endothelium.

There is a strong tendency in human medicine at the present time to use anti-histamines rather than adrenaline to combat allergies. So far as the writer is aware but three antihistamines are available for veterinary use, benadryl (P. D. & Co.), pyribenzamine (Ciba) and torantil (Winthrop). None of any of them was on hand at 3:00 a.m. on this particular morning.

Udall and Brumley in their textbooks record no cases of anaphylaxis in dogs, although Udall mentions cases in horses and cows. Milks mentions symptoms of lowered blood pressure and body temperature, reduced metabolism, somnolence and difficulty on arising. This case presented none of these symptoms.

EDWIN E. EPSTEIN

Chelsea, Mass.

Choke Caused by Bailing Wire

October 15, 1946, a call was received to treat a 23-year-old mare. On examination the following symptoms were observed: Slight swelling on the left side of the neck just posterior to the ramus of the mandible, a mild epistaxis, some dyspnea with severe grunting.

Diagnosing the case as choke, attempts were made to relieve the animal by external manipulation of the swelling, lentin injections, and unsuccessful attempts at passing a stomach tube.

The following morning the mare was much worse and showing severe dyspnea. In spite of the disturbed respiration the animal was anesthetized, cast and attempts made to relieve the choke by manual removal of the obstruction. Although a mouth speculum was employed, the attempt was unsuccessful.

Surgical intervention seemed the only method left and after preparation of the operative area, a four-inch skin incision was made over the swelling. The parotid gland was reflected and the tendon of the sternocephalicus

was divided in an attempt to expose the esophagus. Care was taken not to injure the carotid or jugular vessels and their tributaries. A two-inch piece of bailing wire of which ¼ inch had passed entirely through the wall of the esophagus was removed by grasping with pliers and withdrawing it, thereby making esophagotomy unnecessary.

The wound was packed with gauze soaked in a sulfanilamide-sulfathiazole-urea mixture and the mare made an uneventful recovery.

MANFRED PARKER

Kingfisher, Okla.

Penicillin Therapy Ineffective in Tetanus in a Horse

The report by Captain Lichty[1] on "Penicillin Therapy in Tetanus" prompts this report.

February 21, 1946, we were called to see a ten-year-old gelding whose owner stated "was stiff behind and could not open his mouth wide enough to eat or drink." The condition had been noticed for about 24 hours before we were called.

Upon examination, it was noticed that the horse had great difficulty in backing out of his stall. The hind legs were stiff, the neck rigid, and both of the nictitans membranes were protruding to some degree. The mouth could be opened only enough to admit the flat opened hand. When water was given with a dose syringe, swallowing was not difficult. The temperature was normal and did not rise above 103.4° F. during the course of the disease. No wounds of any sort could be found on the animal. A diagnosis of tetanus was made and a guarded prognosis given. The following therapy was instituted:

2/21/46 afternoon: The horse was placed in a boxstall away from the other animals. The windows were curtained with grain sacks to darken the stall. 50,000 units tetanus antitoxin and 200,000 units penicillin were given intravenously.

2/21/46 night: 60,000 units of antitoxin, 100,000 units of penicillin and 150,000 units thiamin hydrochloride, intramuscularly and 250cc 50% dextrose intravenously were given.

Three times during the day grain was placed on the tongue and was readily swallowed. In addition, water was pumped into the mouth with a stomach pump and tube and was easily swallowed.

2/22/46 morning: 60,000 units tetanus antitoxin and 100,000 units of penicillin intravenously.

2/22/46 afternoon: 30,000 units of antitoxin, 100,000 units of penicillin and 150,000 units of vitamin B_1 intramuscularly.

2/22/46 night: 30,000 units of tetanus antitoxin and 100,000 units of penicillin intramuscularly.

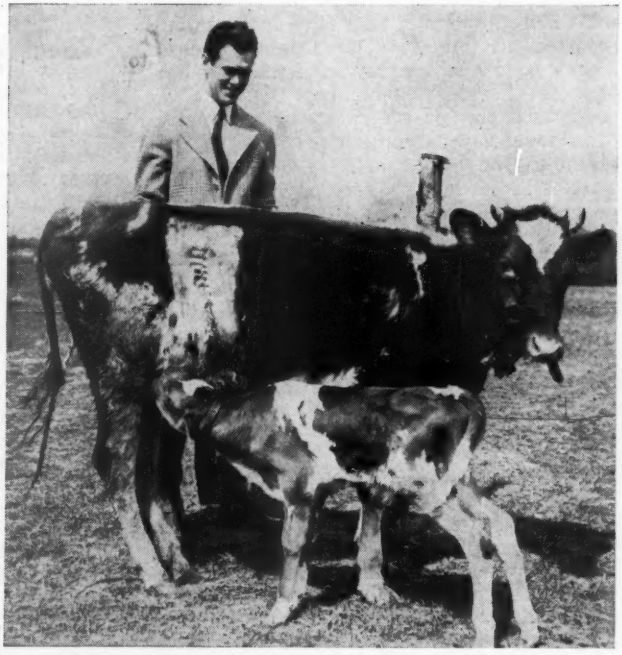
2/23/46 morning: Same as preceding and 150,000 units of vitamin B_1 intramuscularly.

2/23/46 night: Same but vitamin B_1 omitted. Treatment was discontinued for financial reasons, but when seen later on

2/27/46 nearly all the stiffness had gone from the hind limbs. There was greater flexibility of the neck, and the horse would nibble on hay thrown on the floor before him. Recovery was complete by March 22, 1946, when the horse was seen again, this time with a case of colic, from which he died.

R. FRANK VIGUE

Sanford, Me.



Doctor Vigue recently delivered a 100-pound bull calf via cesarean section from a small heifer only 16 months of age. The doctor is obviously pleased with his handiwork on the third day after the operation

[1] Veterinary Medicine, 40:10, page 348, 1946.

Abstracts

Salmonella Suipestifer Infection in Children

Salmonella suipestifer infection has been observed in 18 patients at the Children's Hospital, University of Pennsylvania, according to Lee and Pones.[57] Emesis occurred in four patients; diarrhea in nine, respiratory infections in 12, otitis media in nine and bronchopneumonia in two. There were two deaths in the group. Sulfathiazole and sulfadiazine were without effect as were also antibiotic agents available. Streptomycin was not tried.

Warble Infestation in a Boy

Warble myiasis in man is rare. Only six cases of *Hypoderma lineatum* myiasis have been reported.[58] Cases involving *H. bovis* are somewhat more numerous. In a case of the former reported an immature larva was expressed from a typical warble just above the right eyebrow in a seven-year-old boy. Complete recovery was prompt. No history of infection or of subsequent wandering of the larva was obtainable. The boy lived in a district where warbles in cattle were very prevalent.

Vitamin E Deficiency and Sudden Death in Cattle

In an extensive study[54] at the Minnesota experiment station to determine the role of vitamin E in the nutrition, many animals were maintained on vitamin E free diets throughout their lives. Among such animals a considerable number died suddenly without apparent cause nor could any lesions, to account for the death, be found on necropsy. The circumstances were such as to arouse the suspicion that these sudden fatalities were due to cardiac failure. This and the recognized fact that animals suffering from vitamin E deficiency frequently develop muscular dystrophy—white muscle disease of lambs and calves and domestic rabbits—led the authors to make monthly electrocardiograph recordings of all animals in this experiment. A case of sudden fatality occurred in one heifer in which both the sire and dam of this heifer had been on a vitamin E free diet all their lives and both had died suddenly without apparent cause. This heifer calved normally when but 16 months and 19 days of age. She died suddenly at the age of 21 months. Electrocardiograms made monthly during the last five months that the heifer lived showed a progressive deterioration of the cardiac muscle.

Histamine Injections Simulate Laminitis

Intravenous injection of histamine[50] in five horses was followed in the case of two animals by edema of the feet, which was particularly marked around the coronet. Two animals were slightly lame in the forefeet on the day after the injections. These findings tend to confirm the authors' suggestion that histamine may be concerned in the etiology of laminitis. Changes in the blood included neutrophile leucocytosis, eosinophile leucopenia, increased sediment rate, a fall in serum phosphorus and a rise in serum phosphotase.

Vaccine from Avirulent Anthrax Organisms

A vaccine[56] made of avirulent, uncapsulated strains of anthrax organisms was developed in the Onderstepoort Laboratories of the Veterinary Service of the Union of South Africa. Up to the present more than 30 million doses of this vaccine have been used in the field; use at present exceeds six million doses a year. This vaccine has been far more satisfactory than the Pasteur type spore vaccine formerly used. Although 15 million doses of the vaccine have been used in the past three years only 20 complaints have been received concerning it and of these only one represented a failure of the vaccine.

The immunizing power of the vaccine is easily tested on guinea pigs and it has been possible to dispense with large animal tests.

Detoxicating Properties of Heparin

Certain interesting properties of heparin seem to indicate that it may be used not only as a prophylactic against certain spontaneous thrombo-embolic complications, but also as a detoxifying drug for prevention of such phenomena as may result from some medicinal agents.[54] It is not only a hormone-like substance normally present in circulation, tending to keep blood fluid, but it is a pharma-

[57] *Mm. J. Med. Sci.*, 211, p. 723. 1946.

[58] Smith, Arthur. A case of myiasis due to warble-fly larvae. *Brit. Med. J.*, No. 4464 (July 27), pp. 120-121. 1946.

[54] Gullickson, Thor W., and Calverley, Chas. E. Cardiac failure in cattle on vitamin E free rations as revealed by electrocardiograms. *Sci.* 104:2701, pp. 312-313. 1946.

[50] Akerblom, E., and Sjörberg, K. Das Blutbilt beim Pferde nach laudauernder Histaminapplikation. *Arch. Exp. Path. Pharmakol*, 189, pp. 53-63. Abst. in *Vet. Bul.*, 16:8, p. 270. 1946.

[56] Sterne Max. Avirulent Anthrax Vaccine. *Onderstepoort J. Vet. Sci. & An. Indus.*, 21:1. 1946.

[54] Macht, D. I. Detoxifying properties of heparin in anaphylaxis. *Sou. Med. J.*, 37, p. 402. 1944. Abst. in What's New.

cological antagonist for certain drugs that promote coagulation. It has been found to lower the toxicity of digitalis, ouabain and congo red for cats, to diminish the toxicity of crude cobra venom in cats, and to exert a protective action against anaphylactic shock in 50% of guinea pigs which had been sensitized to horse serum. It had been noticed that some cardiac patients treated with digitalis died unexpectedly of coronary thrombosis. There is no doubt in the writer's mind that prior injections of heparin inhibit the anaphylaxis which is produced by the injection of serum.

Congenital Gonad Hypoplasia in Cattle

The author,[51] Head Professor of the Royal Veterinary College, Stockholm, in association with Professor Nils Lagerlöf of the same institution and Helge Ryde, government cattle-rearing consultant, conducted a seven-year investigation of breeding difficulties in Swedish Highland cattle that by 1935 had become so serious as to threaten the perpetuation of that very desirable breed.

The condition was an arrested development of one or both testicles in bulls and one or both ovaries in cows. Animals with but one hypoplastic gonad bred normally but their breeding life was probably somewhat shorter than that of normal animals. Those with bilateral hypoplasia were, as a rule, completely sterile. One-side hypoplasia in bulls was easily recognized by the asymmetry of the scrotum by the time they were eight or nine months of age and often earlier. In heifer calves the condition could be determined by palpation of the ovaries at about six or seven months of age. Bitlateral hypoplasia, however, could not be recognized with certainty, and then needed confirmation by an examination of the seminal fluid (absence of spermatozoa) and the absence of estrus. There were many different degrees of hypoplasia from very slight to gonads which contained only connective tissue with an entire absence of parenchymatous areas. There were also transitional forms, distinguishable from normal organs only by microscopic examination.

The investigation was made more difficult because (1) the genetic factor responsible for the hypoplasia was a recessive with incomplete penetrance and (2) there existed in the same herds a genetic factor which caused apathy toward copulation in bulls and cystic ovaries in cows. The factors were approximately equally distributed and many animals carried both factors. There was no genetic connection between the two.

The hypoplasia affected the sexes in an opposite manner. The bulls were smaller than normal animals; the cows larger.

Other breeds of Swedish cattle were examined. No hypoplasia was found in red polled or Tronder cattle, but it was found in the Swedish S.R.B. breed and in Swedish lowland cattle.

The development of gonad hypoplasia in the Highland cattle breed is interesting. The genetic factor responsible for the hypoplasia is thought to have been introduced about 1860 by grey, brown Alpine cattle imported from Switzerland (Alguer breed). But no note was taken of it for about 30 years. In 1896 the Highland cattle breed association was formed and a program of improving the breed undertaken which, of course, resulted in much inbreeding. The prevalence of hypoplasia began to increase, at first slowly but progressively faster and faster until by 1935 leading breeders became greatly concerned as to the future of the breed. As a result of the research of Ericksson and associates the government began a program of subsidizing the elimination of bulls with unilateral hypoplasia of the testicles and breeders voluntarily eliminated many of the cows having one hypoplastic ovary. The condition has since diminished rapidly in extent but it is thought complete elimination of the factor will require many years.

Anesthesia and Vitamin C

Animals were studied[53] to determine the effect of anesthesia on the vitamin C content of plasma and the effect of C avitaminosis on the animals' response to anesthetic agents. During the first seven hours following a 45-minute period of anesthesia in dogs, the plasma ascorbic acid level increased markedly. Subsequently, the plasma level fell within 24 hours to below preinduction control levels independently of the anesthetic used. The increase and subsequent depletion of plasma vitamin C levels are thought to be due to the effect of anesthesia on the distribution and excretion of the vitamin. Vitamin C deficiency caused guinea pigs to be more quickly inducted into a state of anesthesia and more profoundly depressed by a given concentration of the anesthetic agent. The vitamin C deficient animals recovered slowly, if at all, from a duration of anesthesia which had little apparent after-effect on guinea pigs that had received supplemental feeding of ascorbic acid.

[51] Ericksson Karl. Hereditary forms of sterility in cattle (in Erglish). Collected papers from the Royal Veterinary Institute for 1944, pp. 9-155. Stockholm, Sweden.

[53] Beyer, K. H., Stutzman, J. W., and Hafford, B. Relation of vitamin C to anesthesia. *Surg. Gynec. & Obstet.*, 79, p. 49. 1944. Abst. in What's New.

Book Reviews

Fundamentals of Microbiology; both general and applied to fermentations.—By *C. Arnaudi*. 758 pages. Casa Editrice Ambrosiana, Milan, 14 Corso Buenos Aires. 1945. Price 900 Lire.

The book is divided into six sections presenting a thorough and accurate analysis of microbiology.

Part I is a general discussion of the morphology and physiology of bacteria, cultivation of bacteria, bacteriophage and viruses. At the end of this section, criteria for identification and the decimal formulae of some schizomycetes, in accordance with De Rossi's symbols, are given. While appreciating the advantages of grouping the main differential characteristics of microorganisms, one may question why the author omitted *Pseudomonas aeruginosa* from his table.

Part II deals with the mechanism and applications of enzyme processes as well as antibiotic substances such as penicillin.

Part III, the section on the bacteriology of milk and milk products includes a discussion on sanitation from the public health standpoint. There are included a few pages that may serve a useful purpose for dairymen. The author describes methods used in the production of a special variety of cheese produced in the Po Valley.

Part IV deals with bacterial action on vegetation, Arnaudi describes maceration of textile plants as it is applied in the "Maceri." Methods worked out by Carbone for industrial maceration might be a worthwhile contribution to the American textile industry.

Part V deals with microbiology of the soil. The subject is developed with great accuracy.

Part VI which gives laboratory procedures and exercises in my opinion offers no improvement over American textbooks. On the whole, however, Arnaudi's experience as a teacher of agricultural microbiology at the University of Milan and as an expert at the Agricultural Experimental Station in Crema has enabled him to present a textbook, which is especially useful to students taking courses on this subject as well as to technicians engaged in enzyme industries.—ALBERTO A. ASCOLI.

Any book reviewed in these pages, or any other book if available, may be obtained by remitting the published price to VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago 49. Bulletins and Circulars should be requested direct from the address given in the notice. Generally they are supplied free unless a price is stated.

Useful Bulletins, Circulars, Etc.

Methyl Bromide as a Delousing Agent. Circular No. 745, USDA, Washington 25, D. C.

Squab Raising.—Farmers' Bul. No. 684. Revised 1946. USDA, Washington 25, D. C.

Sheep Diseases.—Circular 130, California Extension Service, Berkeley.

Swine Pastures Increase Profit.—Article 28-42, Michigan Agr. Exp. Sta., E. Lansing.

Maximum Utilization of Roughage by Steers.—Article 28-44, Michigan Agr. Exp. Sta. E. Lansing.

Properties and Applications of DDT.—H. M. Stationary Office, York House, Kingsway, London, W.C.2, England. Price 15 cents.

Use of the Rapid Whole-Blood Test for Pullorum Disease (Revised).—A meticulous description of every step in making the test. Miscellaneous publication No. 349, USDA, Washington 25, D. C.

Our American Government.—284 questions and answers. A comprehensive story of the history and functions of our American government, interestingly and accurately portrayed. Document No. 465, 79th Congress. For sale by the Superintendent of Documents, Washington 25, D. C. Price 15 cents.

Microscopic Technics for Determining the Bacteriological Quality of Milk.—Complete description of the methods of examining milk microscopically for contamination and sources of contamination and as a check on production and processing methods. Cir. Bul. 186, Michigan Agr. Exp. Sta., East Lansing.

Treatment of Cattle for Chronic Streptococcus Mastitis with Crude Penicillin.—A record of the treatment of 340 infected quarters with follow-up examinations for a period of 15 months. The experiment was commenced in June, 1943. Refined penicillin was not available and crude substrates containing only eight to 12 O. U. per cc were used for mammary infusions. Results were remarkably good from two udder injections with an interval of two to three days. Reprint from a discussion in *Skandinavisk Veterinärtidskrift*, 1945, by K. A. Jensen and Aage Jepsen, Royal Veterinary and Agricultural College, Copenhagen, Denmark.

Infection by Group G-Streptococci in Animals.—A review of the literature and a record of experiments with 52 strains of *beta*-hemolytic streptococcus from canine sources, three strains from cats and 11 strains from human sources. The author concludes that these organisms ordinarily occur as saprophytes on the various mucous membranes of the dog but in cases of impaired resistance of the animal such as infection with the virus of canine distemper they may set up secondary bronchopneumonias. The infection of newborn pups by these *beta*-hemolytic streptococci is responsible for a material part of pup mortality. A reprint (in English) from a discussion in *Skandinavisk Veterinärtidskrift*, 1945, by Sven J. Olsen, Royal Veterinary and Agricultural College, Copenhagen, Denmark.

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Veterinary Practice VII

Special Formulae

By E. T. BAKER
Moscow, Idaho

In presenting a few favorite formulae it is done in the hope that they may prove useful to other practitioners. However, it should be kept in mind what may be efficient in my territory may be valueless in other environments. It is these variations in disease and treatment that keep the individual practitioner in business and he must meet his own special problems in his own way. It is unnecessary to go into a discussion of these problems, for every practitioner is familiar with them; in many cases, like fleas on a dog, they keep him scratching.

As practitioners we are surrounded by hosts of "medicine men," ranging from high school instructors who imagine they know more than a graduate veterinarian, to the ubiquitious "handy man" who are found everywhere—like English sparrows and cockroaches.

It is much like the physician who, surrounded by nostrum peddlers, sure cures at the drug stores, their din over the radio, yet calmly pursues the even tenor of his way. He knows when people get sick they will call him and he seems to thrive in spite of all these drawbacks.

And so, if the average, private veterinary practitioner takes care of his business and ignores much of this fly-by-night competition, he too prospers. I am not inferring we should not take some steps against these encroachments, but the more one fights the more publicity it gives the intruder and the less one accomplishes. The old observation that molasses attracts more flies than vinegar is not based upon an optical illusion.

If one has the confidence of one's clients, one will usually have all the work one cares to do. There are other things more worth while in this world than making a lot of money.

Peculiar Seasons

One peculiar think we have noted in our practice and others have, no doubt, had the same experience is, that time-tested remedies may fail in certain seasons or abnormal times, such as war years, extreme drouths, etc. At such times vital deficiencies so reduce the patient's resistance that larger doses must be administered, or other measures used. For example, a few years ago, or about the second year of the war, we began noticing a number of "repeat calls" to our milk fever cases. The initial dose of calcium gluconate was stepped up from 500cc to 750cc and the dose of camphorated oil was increased from 20 to 40 or 50cc. This restored normality.

At the same time many pigs, apparently anemic, "keeled over" after the owner administered large doses of phenothiazine, and weak horses might "faint" after receiving bot capsule containing a dose of normal size. Puppies died like flies that have contacted DDT from all sorts of intestinal ailments, as did kittens and domestic rabbits. Sterility in cattle increased in our section and many sheepmen reported large losses due to "dead lambs."

It seems that the practitioner who keeps up with the time will need to change his formulae from season to season. What may work this year may fall down the next.

As we answer up to 1500 veterinary questions a year for a large farm journal we have the opportunity to keep in touch with live stock troubles all over the northwest.

"My cows don't come in heat," writes one subscriber, while another reports "our pigs get down behind and can't get up." One complains about his milk goats giving bloody milk," while others write "our kittens have the snuffles, and they die quick."

With the advent of the sulfa group, penicillin, DDT and a host of new preparations, practice is undergoing radical changes but there are a few "old reliables" that will be good always.

One thing about the common drugs I use is that one of them can be used for many conditions. Thus, the bovine laxative can be used for bovine impaction, acute mastitis, equine indigestion, ovine impaction, ovine blue bag—to mention a few—and it may be employed as a vehicle for many other drugs.

The colic mixture is useful in bloat, colic, indigestion, scours and thumps. It may be mixed in oil, water, milk, elixir lactated pepsin, honey, syrup, glycerin, or given straight, depending upon the circumstances.

Thus, if one gets caught out in the country and runs short of one particular medicine, he can always use one of these, temporarily, to advantage.

Some Old Reliables

Here are a few formulae we have found useful through the years in our work:

Bloat Medicine

1. ℞ Colic mixture.....ʒii (℞ No. 3)
   Liq. cresolis comp.....ʒi
   Ammon. aro. spts.....ʒi
   Bovine laxative .....ʒx (℞ No. 2)
   Mineral oil .....q.s. ad ʒxxxii
   M.
   Sig. Shake well and give at one dose.

We must get away from the farmer's idea that bloat is simply an accumulation of gas. It is that plus intoxication and deranged rumenal function, perhaps anoxia. The bloated cow is a sick animal. True, most of bloat will recover if the gas is removed, but most of them do better if concomitant conditions also are treated.

Bovine Laxative

2. ℞ Sod. thiosulphas 3xxxii
Sod. chloridi 3xvi
Flext. Rham. Purshiana.....3iv
Sol. saccharin 3i
M. In 10-qt. granite pail, and fill up with boiling water, and stir.
Sig. One pint as indicated.

Colic Mixture

3. ℞ Chloroform 3viii
Etheris 3viii
Ol. eucalyptus 3iv
Camphorae gum 3ii
Ol. terebinth. q.s. ad.....Cong. I
Carmine q.s.
Sig. One ounce in capsule as needed.

Along about here it is perhaps a good place to remark that administering a combination of small doses of several synergistic remedies instead of an enormous dose of one of them does *not* constitute shotgun medication.

Footrot

4. ℞ Liq. Cresolis comp.....3ii
Methyl violet 3i
M. Let stand over night. Shake well and add equal parts kerosene and mineral oil. q.s. ad cong. I.
Sig. Shake well before using.

Liniment

5. ℞ In a middle aged, freshly shampooed gallon bottle place:
Aq. ammon. fort. 3ii
Add 500cc warmed aqua
Ac. oleicum 3ii
Add another 500cc aqua
Ammo. chloridi in 500cc aqua.....3iv
Aqua color red.....3i
Methyl salicylas 3ii
Ol. terebinth. 3x
Red oil color.....3i
M. Shake well, and fill bottle with aqua calens. Shake each day for a week.

Red Oil Liniment

6. ℞ Camphora 3ii
Ac. sulphuricum 3ii
Stir together in large mortar with glass rod. Allow to stand over night.
Next morning, add:
Ol. terebinth. 3xxxii
Ol. eucalyptus 3ii
Red oil color.....3i
Stir well and allow to smoke.
Siphon off next day.

1937, when prontosil the first sulfa drug came into use by veterinarians, to 1946, when penicillin became available at a price that veterinarians could afford to pay, marks a decade that has witnessed astonishing, unbelievable, inconceivable progress in pharmacology and therapeutics. The first decade of the 20th century was one of marked achievement in chemotherapy. When I was graduated from the College of Veterinary Medicine, O.S.U., in 1909, the fame of Paul Ehrlich was at its height. He had developed a chemical specific for various tropical protozoan diseases, and for a spirochetosis not mentioned in polite society in those days. I confidently expected, when I left college, to have a chemical antidote for every infection in just a few years. Like Moses I had been shown the Promised Land but was not to enter it—*i.e.*, not for 25 years and not until my active veterinary career was more than half over.

Now again, from the western slope, I view the Promised Land, that I saw so long ago in the bright morning sunshine. In fact I'm a good way into that land for I possess ready to hand new and better antiseptics, safer anesthetics, more hog cholera prophylactics, strain 19, a satisfactory rabies vaccine, DDT, a whole group of sulfonamides, with a tremendous field of usefulness, and tyrothricin and penicillin which are just as near miracles as I expect to see this side of my Eternal Home. But I see greener pestures ahead in which gambol streptomycin subtilin, bacitracin and a hundred, perhaps a thousand other mold, plant and bacterial products and all manner of synthetic chemicals each channeled against some enemy of man or his animals or his crops.

The new vision almost fulfills the old predictions, but not quite, for after making 30 thousand farm calls we can still envision much need for sanitation, which is a manure fork and shovel with a highschool education and for laxatives which are the same things applied internally. Nor can we see sick animals that will not feel better for being given tonics and stimulants; nor painful tendons that are not helped by liniment and massage, nor pain that doesn't call for sedatives. We make every use we know how to of the splendid therapeutic agents that scientific research and fortunate discovery has given us and we shall eagerly adopt still others as they become available. But, we will not eliminate the "old reliables," those multipotent remedies that have served us through the years sometimes sufficient in themselves but more often as a supplement to more specific therapy, a sort of therapeutic Blüchers Army that tips the scales to the side of the ailing animal and supports it while the main effort routes the infection.

(To be continued)